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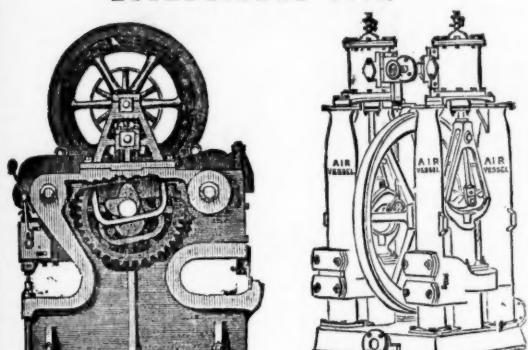
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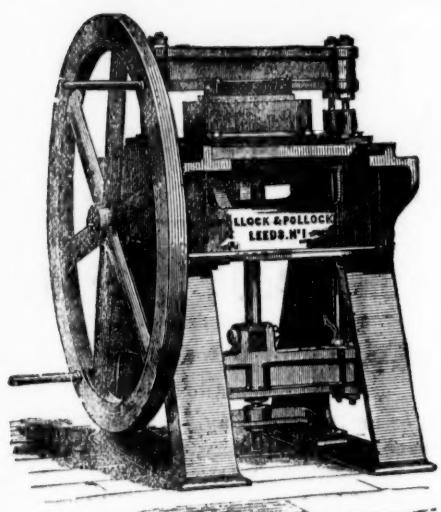
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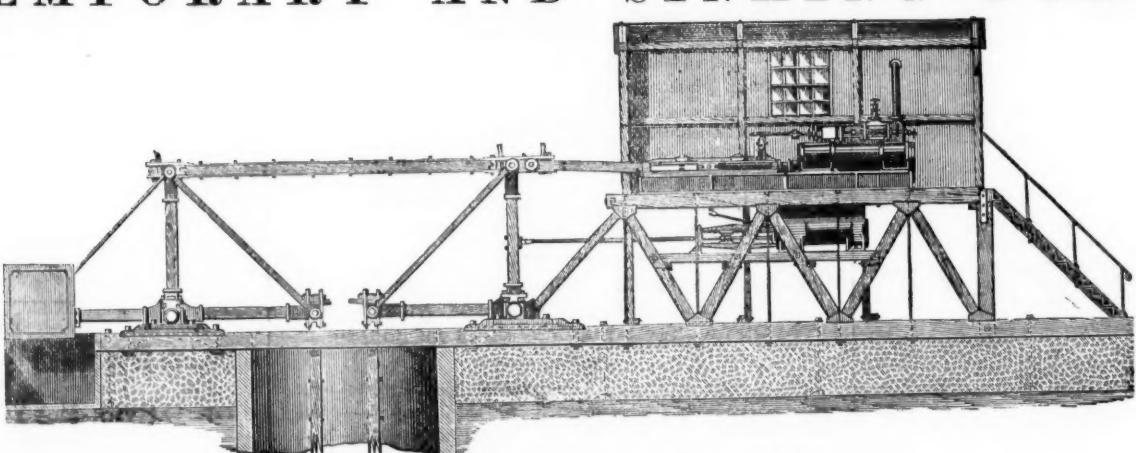
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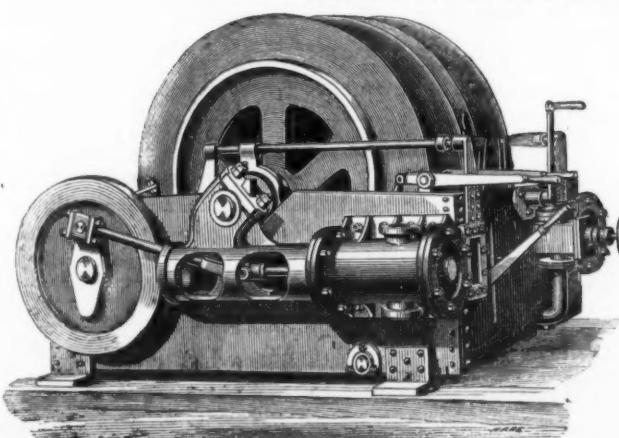
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Original Correspondence.

TIN MINING IN LARUT—No. I.

BY P. DOYLE, C.E., F.S.S., M.R.A.S.

(Formerly of the Kurhurbae Collieries, East Indian Railway, Bengal.)

The tin industry is fast developing, under British protection, in Larut, and bids fair to eclipse, in a period far from remote, the productions of the other parts of the peninsula and islands of the Archipelago. There is no exaggeration in the statement that its deposits (which exceed in richness those of any other tin-producing country in the East), if worked with British capital and enterprise, with appliances of modern machinery, would surpass the production of any other part of the known world. Before proceeding to describe the geological features of the country, and deal with its mineralogical productions, a brief historical summary by way of introduction will not, it is presumed, be devoid of interest or unacceptable to readers. Every now and again some great catastrophe arouses our attention, and forces us in spite of ourselves to search more carefully the distant locality in which the event has taken place. It is not long since the murder of Mr. Birch, a representative of the British Government in the State of Perak, drew the attention of Englishmen more immediately to the Malay peninsula. On the west coast of this tongue of land, which stretches nearly to the equator, lies the rich territory of Perak, once ruled over by a sultan and his petty chiefs. Larut, the subsidiary district of Perak, was under an enterprising man, appointed by the then reigning sultan before 1855, and from the revenue of its large tin mines afforded him the opportunity of privately enriching himself. This man kept the Chinese—who comprise the bulk of the population—under control, but on his death, and the succession of his son, these split up into two rival sections, and began a series of disturbances, and subsequent piracies, which led finally to the necessity for British interference in self-preservation, since the contagion of disaffection was spreading to Penang, Malacca, and Singapore. British residents and assistant residents were sent to the Court of the sultan to help him to preserve peace in his dominions. It would be out of place here to dwell on the treachery of the sultan and his chiefs, which culminated in the assassination of Mr. Birch, their punishment, and the new regime as a British protectorate. It will suffice for our purposes to mention that, as regards Larut, considerable success has all along attended British intervention in the affairs of this sub-division of the State, and that its social and political condition is on a par with that of the adjoining British settlements, of which it will become, it may be safely presaged, as an inevitable result of the existing policy, a valuable component. Readers desirous of becoming acquainted with every interesting point of information of this rich and wide-spreading country—"so mild in climate, so luxuriant in vegetation, so regular in succession of refreshing rains, so univised by storms that prevail in the East"—are referred to Major McNair's recent valuable work,* which will amply repay perusal.

The geological formation of the peninsula has been described as granitic, overlaid most generally by sandstone, and frequently also by laterite or cellular clay ironstone, and to the north by limestone. A granitic mountain chain runs along the whole length of the peninsula, and on both sides of it, but particularly on its western one, or that sheltered by Sumatra, there are extensive alluvial plains little above the level of the sea. The prevailing metals are iron, tin, and gold. Iron ores are found everywhere, and tin in all parts where it is sought. There is a striking resemblance in the mineral characteristics of all parts of the Malayan Peninsula, particularly as regards the unvarying general conditions under which the deposits of tin are found throughout the full extent of the Malayan field, stretching as it does over 17 degrees of latitude and 10 of longitude, from Tenasseram (Tavoy) in the north to Banca and Biliton in the south, and the observations of Messrs. Logan, Horsfield, and others in different parts of this area have been verified in a corresponding identity with those recently noted in Larut.

Perak is the second Malay State of the western side of the peninsula, counting from the north, and Larut, its chief province, is an irregular strip of country about 70 miles in length, varying from 10 to 25 miles in breadth, bordering on the coast. The physical aspect of Larut is level from the sea shore to some 10 miles inland, where the mountain ranges rise to an altitude of nearly 5000 feet above the level of the sea, and run in an almost unbroken line in a north-westerly direction, with detached hills at intervals at their base. The whole of the land lying along the base of the Larut ranges is more or less stanniferous. This strip is in length about 50 miles, with an average breadth of 6 miles. The level of this belt is even now undergoing a change by the alluvium brought down from the hills by a rainfall exceeding 150 inches throughout the year. All the ore heretofore worked has been found in the alluvium or detritus of ancient mountains—what is called in mining language "stream works"—obtained by washing the soil in the same manner as, for the most part, gold in Australia and California. No ore has ever been obtained by mining the rocks containing veins of it, although it has been traced to them.

The tin beds are composed of debris of granitic rocks, mixed with the ore—which, exemplifying the various stages of progression from the lode in the hills to the dust on the plains, the fragments becoming smaller the further they recede down and from the hills, and proving beyond a doubt that attrition of enormous power has at some period of the earth's history been brought into play—varies in size of crystal (per oxide of tin) from that of fine sand to that of an ordinary quartz pebble. Conflicting geological speculations exist regarding these deposits of tin ore. There can be no doubt that they are of alluvial origin, and many circumstances place this beyond a doubt. The earlier waste of the hills before alluded to, which consists of a coarse granite in which the tin-stone united with iron ore is enclosed in veins, appears to have produced by a slow decomposition of rock itself successive layers, in which the secondary tin is now found. This process, but in a modified form, demonstrating how deposits have been spread over large areas during long periods, are in active operation at the present day. Further, the embedded remains—including the trunks of trees in various stages of decay—frequently met with in the workings, all tend to prove that some of the deposits may be appropriately designated as "recent."

Sections of the mines show that the strata under the soil consist of alternate bands of sand, with sometimes high admixtures of dark clay of different colours. There is something singular in the appearance of these strata, which exhibit strikingly the agitation of water at the period of stratification. There is also striking evidence of the operation—visible in the arrangement of the superior strata—a powerful cause in the effect produced on the separate fragments comprising the last layer which contains the ore of the tin. These substances are almost purely siliceous, composed of quartz, felspar, mica, schorl, among which are found occasionally masses of clay, but they appear to have been subjected to a power which in many cases has completely dissolved their union or the adhesion of their particles. Most of them are so loose in their texture that they cannot be handled without separating and crumbling to pieces. The regular striated surface which appears on some of these fragments is highly characteristic of their original composition. The particles of quartz have remained, and show themselves on the striae, while the felspar separates as a white powder. Many of the fragments possessing more solidity, have rounded angles, and their surface marked with numerous intersecting lines shows them to belong to those siliceous rocks occurring in extensive veins in different parts of the country.

The termination of the tin stratum is indicated by a peculiarly white clayey substance, which becomes friable by drying, and is called Kongtay by the Chinese. The Kong is everywhere of precisely the same quality. Sometimes yellow, sometimes white, or somewhat of a bluish colour, and consists of kaolin; sometimes mixed with fine quartz sand, which is a decomposed product of felspar. Borings through the Kong taken to a depth of 20 ft. yielded nothing but the same, with more or less quartz sand.

Differences of opinion arise as to whether this white (porcelain)

clay will be found invariably underlying the stanniferous deposits. In the Larut field it may be considered as the general mode of occurrence, the only exceptions to the rule being where the tin stratum rests upon sandstone. Even in these instances opinions vary as to the possibility of this being another form of the silicate of alumina with a large admixture of the quartz sand before adverted to.

The following are sections of the mines in different localities, giving a very fair criterion of the district:

		I.	IV.		
Vegetable mould	Ft. 1·25	Red loam	Ft. 2·00		
Loam 1·00	Sand drift 5·50		
Sand 4·00	White grey clay 4·50		
Bluish clay 3·50	Black clay, containing			
Darkish clay 3·75	trunks of trees 2·00		
Stratum of ore 6·00	Stratum of ore 5·00		
		Pipe-clay	? ?		
		II.	V.		
Mould soil Ft. 3·00	Red loam	Ft. 4·00		
Varying shades of clay, from dark yellow to whitish grey 12·00	Sand drift 8·75		
Light gravelly drift 3·00	Whitish grey clay 9·25		
Stratum of ore 6·00	Stratum of ore 6·00		
		Sandstone	? ?		
		III.	VI.		
Mould soil Ft. 4·00	Red earth loam	Ft. 5·00		
Shades of sand from white to brown 4·00	Whitish grey clay 3·00		
Dark grey sand 6·00	Drift sand 8·50		
Stratum of ore 4·00	Stratum of ore 8·00		
		Sandstone	? ?		

Some idea of the irregular and confused stratification of this tin field may be derived from the fact that in an excavation (working) of less than 100 ft. square the details of the sections of no two of its sides were similar, although, of course, all agreeing generally.

The depth at which the stratum of tin ore is obtained and its thickness depend upon position and locality. The mines cover an area of nearly four square miles—or less than a tenth of the accessible tin land—divided into three sections, viz.:—Asam-Kumbang, Kamunting, and Topai, in the order of their existing size and importance. The variations of depth and thickness of the ore layer may be seen from the following statement:

Thickness.

Sections.	Mean.	Range.	Mean.	Range.
Asam Kumbang	16·0	10 to 25·5	3·0	2 to 5·0
Kamunting	9·9	4 to 21·0	4·9	2 to 7·5
Topai	18·2	12 to 25·0	5·1	3 to 7·0

* Derived from 15 mines; † from 43 mines; ‡ from 21 mines.

There is probably no working of a greater depth than 30 ft., or deposit of a greater thickness than 10 ft., which figures may, therefore, be safely taken in these respects as the *maxima* for the field.

At present the extensive mining operations in Larut are carried on entirely by Chinese, which nationality also probably forms nine-tenths of the population. There have been various estimates framed, all more or less based on uncertainties, as to the Chinese population in Larut. It is exceedingly difficult to determine the number even approximately, scattered as they are, and so irregularly distributed—14,000 may be taken as the limit, the mines affording occupation for fully a half of this number.

There are 80 mines in operation in Larut, owned by 40 kongsee or firms, with an average of nearly 86 men per mine, distributed as follows:—*

Sections.	Mines.	Men.	Range.
Asam Kumbang	38	3827	20 to 210
Kamunting	30	1809	15 to 300
Topai	12	1207	60 to 210

Total... ... 80 ... 6843 ... 15 to 300

To these might be added 96 "Lampang" workings on the hills at various elevations, on which 365 men are engaged, either singly or in small gangs, ranging up to but seldom exceeding six shares.

The four largest and richest mines in the Asam Kumbang section belong to one firm—the Ha Seng Kongsee—which employ upwards of 600 coolies. But the largest mine of any in the country is owned by the Kong Loon Kongsee, in Kamunting, under the direction of an enterprising Chinese gentleman, Captain At Quee, whose appreciation of European appliances is evinced by a centrifugal pump and engine, in supersession of the cumbrous and comparatively useless Chinese water-wheel (of which more hereafter). There are 300 coolies employed on this mine, which is the highest number of all the workings.

(To be concluded in next week's Journal.)

AUSTRALIAN TIN MINES.

SIR.—In a recent number of the Launceston Examiner (Tasmania), I notice a letter from Capt. W. Tregay, of Redruth, to a Mr. T. D. Wickham, about our tin mines and their effect on the Cornish mines. Seeing this has led me to believe that a little information regarding the production of tin in Tasmania may be interesting to you, and I, therefore, pen you these lines in a rather hurried manner, so as to be in time for the outgoing mail to England. There can be no doubt about the alluvial ground in the north-eastern parts of the island having passed its maximum power of production; the best claims are mostly nearly worked out, and are producing much less than they did a few months ago. The decrease in their production will be still more rapid during the next few months, though it may be some time before they are finally abandoned. Fresh ground is here and there being broken, but chiefly by small parties of working-men and tributaries, producing but small quantities of ore, just sufficient to pay them good wages, or a little more than that.

On the first discovery of tin in these parts there was a great rush for claims, and a very large number of sections were applied for and surveyed. Of these very small percentage only has been worked, and a still smaller percentage only has proved profitable to the holders. The working man has been the principal gainer by the tin discoveries. High wages have been paid throughout, ranging from 7s. to 9s. per day of eight hours, according to locality and consequent cost of provisions and kind of work done. Towards the end of last year a party was fitted out in Hobart Town to explore the West Coast, the western half of the island being almost a "terra incognita." Other small parties followed, some going by sea, others overland. These all sent back most glowing accounts of their discoveries of tin ore, reporting in many cases payable quantities of gold as accompanying the tin. These seductive reports caused the formation of numberless prospecting companies, not only in Hobart Town but also in many other little townships. Whilst the regulations still allowed of it, sections were also taken up by the score by people in town. Prospectors were sent out, and all, as if by pre-arrangement amongst themselves, have continued sending back wonderful reports of the wealth of their claims. Some sent back, also, large nuggets and masses of tin ore picked up on the surface.

The consequence of this is that there has been a regular West Coast mania throughout the island, and companies have been formed to work these claims with hundreds of thousands of pounds sterling capital (nominal), the promoters retaining half the shares at least as paid up. Some of these shares have been sold at prices that may be truly termed fabulous, considering the little foundation there was to believe in their value. Well, a few of these companies have already commenced work, and been at it for some months. What have they produced? I believe that not more than 3 tons of ore have been received in town, and that is supposed to be half iron sand. A few more tons are reported to be on the ground, and that is all for the outlay of some thousands of pounds. Now hear the reports of working men who have been tempted to go and see the place for themselves. They one and all pronounce all the alluvial ground there very poor; that one or two claims may pay, but that even that is doubtful, and that all the rest are not worth holding. This is the report of men who meant to benefit themselves, and were acting quite independently of any promoters or companies.

I leave you to judge which report to believe, taking into account also the little that has been produced in spite of all the magnificent reports of companies' prospectors. I know that a great many shareholders are beginning to believe that all they were told was not

quite an "unvarnished" statement. To sum up as regards alluvial deposits, my opinion is that the production is now already on the decline, and will decrease rapidly.

We now come to lodes. At the head of all the tin mines—it is said in the world—stands Mount Bischoff. This is said to be a lode, but not having seen it myself I can form no opinion on the subject. However, it is undoubtedly a very rich deposit of ore, and will last for years under any circumstances, so it is no use waiting for its decline. I am speaking of the one mine known under that name. There are other claims around it, said to be also rich, but nothing like the original mine. It seems certain that there are lodes there, but whether any size or very rich time alone can determine. I incline to the belief, from what I have heard from competent authorities, that Mount Bischoff, as a whole, will produce tin for generations to come. The next lode mine in order of time is Belmont. Machinery is now being erected there for its proper working. It is said that the lodestuff will pay to crush, though only just pay, as far as it has been opened out. The company on that representation determined to erect the machinery and trust to its improving as they opened out further. Splendid specimens of ore were found plentifully strewn about the spot, so that it appears not improbable that their hopes may be realised. Beyond this, no lodes have been as yet even properly prospected.

On the Blue Tier, in the North East, several rich veins of stone have been found, the stone on the outcrop having yielded in some cases as much as 65 per cent. of ore. In one place the veins are in great number, varying from anything up to 4 ft. in thickness, as seen on the surface. The matrix, or body of the mine, is commonly a kind of granite, with leaders in it of quartz or eurite, sometimes very soft. Wolfram and tourmaline occur with the tin ore, as also does copper, carbonate, and pyrites. The tin ore is often in very large crystals. Nothing much has been done as yet to any of these veins, though prospecting them by tunnels on the lodes is now being commenced in two cases.

Of course, the West Coast would not be complete without its lodes also, and accordingly they have been found. I think, however, there is more chance of something turning up with them than from the alluvial deposits. Very fine specimens of lodestuff have been sent to town, consisting generally of chlorite, thickly impregnated with fine tin ore, also many large masses of ore. Some reports say the lodes have been actually found and traced, others again that no lodes are to be seen, but that tin shows here and there in the mass of the rock; some few, that nothing is yet found worth looking at. As regards lodes generally (excluding Mount Bischoff from the consideration), I think it highly probable that some will be found payable, and be worked in good time, but it must be some time before they can produce any very great quantity of ore, and I do not believe they will be able to make up for the decline in the alluvial deposits, at least for some years to come, supposing them even to turn out successful. Taking it altogether, I believe the production of tin in Tasmania will undergo a sensible decrease for a few years at least, though it may afterwards rise to what it was a few months ago. I should think that if the truth were known as to our future powers of production the tin market would become more settled, and prices, perhaps, recover somewhat.

The colonial habit of "blowing" has in this case done a deal of mischief. You, at home, have been in a state of doubt, which has prevented all speculation, and caused prices to gradually recede, to the great loss of the Cornish mine owners and miners, and also to the loss of those here that did all the "blowing." Whilst the newspapers team with reports of wonderfully rich discoveries, which lose nothing by being often repeated, it is no wonder that consumers buy only what they need for immediate use, and speculators stand aloof altogether, so that sales have to be in a manner forced, and prices fall for no obvious reason, and the whole trade gets into a most unsatisfactory condition.

The unsettled state of politics has, no doubt, had something to do with the fall in price, but I think the fear of largely increased supplies from here and Australia has had the largest share in causing it. I have endeavoured to give you what I believe to be a true account of the future of tin production in Tasmania. I hope it may have the effect of allaying the fears of those who believed we were going to still further swamp the market.

Tasmania, Aug. 28.

— A TASMANIAN TIN MINER.

AUSTRALIAN TIN MINES.

SIR.—In reading the Journal of Saturday last I found therein some correspondence about Australian Tin Mines. Your contributors have drifted into a pretty quarrel, but from experience I can state that they are both wrong. As to your contributor who signs himself "Colonist," from Brisbane, I can only say that he is informed very superficially. He gave you an estimate of acres of timbering

most rigid economy; but all will not do. Losses, except in about half a dozen mines, cannot but result from continued working with tin at the present price.

You know, Sir, that for several years past Cornish miners have been buoyed up by the opinion that the produce of the foreign tin mines and streams would fall off; that the tin was simply alluvial, and that within limited areas; that no lode had been discovered, and that, therefore, there would, in a short time, be an end of foreign production. This opinion has been proved to be fallacious, for the production has progressed with time, and of a general falling off there is no symptom. I cannot concur in the opinion that there are no lodes in the alluvial tin districts. I believe that, as in this country, where the earliest operations were on alluvial deposits near lodes, so in Australia, Tasmania, &c., lodes will be found just as we found them here, and no doubt they will be explored as we have explored ours.

A friend of mine—Mr. Joseph Pryor, F.G.S., late of Redruth, is now in Tasmania. He has, it appears, surveyed the tin fields there, and we shall, no doubt, have a faithful report on them. He is, I know, well qualified to give it, being a geologist, mineralogist, and as ever. If Mr. Mufford and "H.W." who wrote in last week's *Mining Journal*, will kindly have patience till an answer can be given to their letters they will, I dare say, have every explanation they require. An answer cannot be inserted within a less period than 12 weeks, because of the distance.

R. SYMONS.

Truro, Oct. 23.

TASMANIAN TIN FIELDS.

SIR.—The following is an extract from the Launceston Examiner of Aug. 31:—"The following letter, written by Mr. Joseph Pryor, M.G., F.G.S., of the Mounta Mines, South Australia, has been forwarded for publication in the West Briton and the *Mining Journal* newspapers, to correct the misstatements made by Mr. Mufford in reference to the tin deposits in this colony." Having visited the mining districts of Tasmania, including Mount Bischoff, Mr. Mufford was regarded as an authority, but he seriously misled his friends in Cornwall, inducing them to believe that the mining in Tasmania was an ephemeral industry. A copy of his letter was forwarded by Mr. Pryor to Mr. H. Ritchie, who has kindly placed it at our disposal."

Then follows the letter as printed in the *Mining Journal* of Oct. 12. It will occur to your readers, as it did to the writer when first read—was this not written in the interest of the Tasmanian tin producers? While the letter contains nothing but evidence of egotistical conceit it must be regarded as in no way affecting the able letters of Mr. Mufford. Mr. Mufford, in his letter in last week's *Journal*, further confirms former opinions. I regret exceedingly to find the statements of Mr. Joseph Pryor so utterly unworthy of notice.

Oct. 23.

H. W.

ECLIPSE GOLD MINING AND QUARTZ CRUSHING COMPANY.

SIR.—In last week's *Journal* I notice another letter, signed by Mr. Potts, late Chairman of the above company, of which I am a bondholder to a considerable extent. I presume the letter is in answer to one of Mr. Nelson's of the 5th inst., containing accusations of the greatest neglect of our money and property. I hardly consider the reply made by Mr. Potts a satisfactory one, as the extracts of Mr. Rickard's letter only contain a complaint, although it appears, judging from the date of the same, Mr. Nelson was retained in a very responsible position until the final winding-up of the company. I do hope some light will be thrown upon this subject, as I have put considerable money into the concern, and have never even received a paper of any kind showing how our capital has been disposed of.

A BONDHOLDER.

COMPRESSED-AIR MACHINES.

SIR.—Compressed air is now largely used in mines and in tunnelling in place of steam or water, the application of compressed air in tunnelling through Mont Cenis by Sommeiller in the year 1857 being the first great work effected by its agency. It is now successfully applied in our mines in driving coal-cutting machines, hauling-engines, rock-drills, and pumping-engines.

The inconvenience attending the use of steam for underground engines is well known, not only from the condensation of steam, but from the difficulty in getting rid of the exhaust when the engine is placed at a distance from the upcast pit. The loss of power when ropes of great length are used for hauling amounts in some cases to 75 per cent. of the motive power. Hydraulic power is now used to some extent for pumping water in mines, with good results when a considerable pressure can be obtained; 700 lbs. was at one time considered to be the maximum working pressure, now 1500 lbs. per square inch is not unusual. Assuming the compressed air to be at 40 lbs. pressure per square inch, and water at 700 lbs., it will be seen that to obtain the same result it will require about 17½ times more air than water, and the velocity through the pipes will be in the same ratio. The friction increases as the square of the velocity, therefore the friction of the air would be 306 times greater than that of water, and there would be 17½ times the quantity to deliver the power required to overcome this friction. The density of the air, however, at 40 lbs. pressure is about 225 times less than that of water—then $306 \div 225 = 1.4$ nearly more friction, and $5359 \div 225 = 24$ times greater power required with air than with water. This would be the result in pipes of the same size and length, but by increasing the size of pipe and reducing the velocity the practical difficulty in the transmission of air is to a great extent overcome. Water-power may be applied to a pumping-engine in a mine—say, with 300 lbs. pressure per square inch on the piston—to pump ten times the quantity expended in driving it, to an altitude of 69 ft., minus the friction of the engine and of the water in the pipes. This may in some cases be a convenient application of water power, but it is not generally applicable. But compressed air is not only suitable as an underground motive power, but also as an aid to ventilation. The air discharged from a pair of 14-inch hauling-engines, at 120 strokes per minute, and 30 lbs. pressure, would be about 2000 cubic feet per minute, and this would be at a low temperature, about freezing point, so that it would have a most beneficial effect in cooling the air and augmenting the current in the working part of a mine, where it is most needed.

The advantage claimed for hauling-engines actuated by compressed air is that they can be placed at the farthest extremity of a mine and moved from place to place as the circumstances of the mine may require them, for convenience of haulage by ropes or for pumping water. The useful effect obtained from compressed air engines is small, but this will evidently vary with the length and size of the air-pipes, the construction of the air-compressor, and the condition of the hauling-engine. As much as 65 per cent. of useful effect is stated to have been obtained in the working of one of the hauling engines at Ryhope Colliery, Durham. The steam-engine on the surface consists of a pair of 32-in. cylinders, 5-ft. stroke; average pressure, 15 lbs., giving out a power of 78-horse, after deducting its friction. The distance from this engine to the underground hauling-engine is about 1500 yards; the power given out by this is 51-horse, without deducting the friction of its own parts. The air-compressor at bank are a pair of 33-inch cylinders, 5-ft. stroke, cylinders and covers jacketed; in the space between the cylinders and jackets a circulation of water is maintained. The useful effect obtained from compressed air in other cases is stated to be only 30 per cent., or 20 per cent. of the motive-power; but the latter may be due, in a great measure, to imperfect machinery, and limitation in the area of the pipes. It is well known that when the air is being compressed great heat is given out from the compressor; it is to prevent this loss of power that the cylinders are jacketed and cooled with water. The temperature of the air at the outlet of the compressor at Ryhope was 212°. The temperature of the air at the receiver at the bottom of the pit was 74°, and the pressure 44 lbs. The temperature at the receiver near the hauling-engine was 58°, and the pressure averaged 38 lbs., the engine being in motion most of the time.

Another cause of loss of useful effect is due to the outlet orifice of the compressor being so constructed that the compressed air cannot escape freely from the cylinder, neither can the air enter freely into the cylinder for compression. It has been proposed to inject cold

water into the compressor in the form of spray, to keep the temperature nearly uniform, and prevent the great increase of volume by heat, which compression always occasions. This expedient may be said to favour the formation of ice at the exhaust orifice of the hauling engine, but this could be prevented by injecting water at the ordinary temperature into the cylinder of this engine also, and enlarging the orifice, so that practically no difficulty would arise from this cause. If the quantity of water injected were such as to keep the temperature nearly uniform in the compressor, and the same in expanding at the orifice of the hauling-engine cylinder, the loss of power that arises from the air heating and cooling would be much reduced; and the practical loss would be in the machinery and in the passage of the air through the pipes.

Authorities differ much as to the useful effect obtainable from air-compressing machines. As this must depend on various conditions already alluded to—the valves of the compressors, the machinery, size of pipes, &c.—if these were constructed on the best principles the loss of power would not be so great as some state it to be—75 per cent., whereas others give the useful effect as 65 per cent., or a loss of 35 per cent. only. The application of compressed air to driving hauling engines underground has been largely carried out at the Powell Duffryn Collieries in South Wales. The steam cylinders are 34 inches diameter, the compressors 40 inches diameter, with 6-foot stroke; steam pressure, 70 lbs., cut off at one-fourth; air compressed to 40 lbs. above the atmosphere. The engines make 20 revolutions per minute, and indicate 480 horse-power. There are 26 hauling-engines driven by compressed air at the Powell Duffryn Collieries in three different sizes. First, for the main roads the engines have two 12-inch horizontal cylinders, 12-inch stroke, geared in the ratio of 1 to 5, with two drums 4 feet in diameter. Second, for the branch roads single-cylinder engines are used of similar construction to those above, with 14-inch cylinder, 12-inch stroke, and two drums. Third, the portable hauling-engines, the extreme dimensions of which are—length, 6½ feet; breadth and height, 4 feet. Each has one cylinder 8 inches diameter, 9-inch stroke, geared in the ratio of 1 to 6, with two drums of 2 feet diameter. This engine can be moved about on the roads, being provided with four wheels for the purpose. The latter engines are intended to supersede the ponies and boys employed in bringing coal from the workings to the branch roads. Experiments made with the air-compressors and engines show that the greatest useful effect is obtained with low pressures.

At 40 lbs. pressure of air the useful effect was 25 per cent.

34	"	"	"	27·1	"
28½	"	"	"	28·5	"
24	"	"	"	34·9	"
19	"	"	"	45·8	"
Oct. 22.				M. E.	

At 40 lbs. pressure of air the useful effect was 25 per cent.

Oct. 22. M. E.

ROCK-DRILLS—THE ECLIPSE AND INGERSOLL.

SIR.—We extremely regret at being forced to ask you to allow us to correct a statement made by Messrs. Le Gros, Mayne, Leaver, and Co., in last week's *Journal*. We neither wished nor desired that that firm should make it known that we had supplied one of our Eclipse drills to the Roman Gravels Mine in June last. What we did desire, however, was that they should correct a misstatement made in the *Journal* of the 5th inst., to the effect that it was the Ingersoll, and not the Eclipse, drill that was doing such good work at the Roman Gravels Mine. We now beg to make it known that Mr. Hocking's statement, made before the Chairman and directors of the West Bassett Mine, and published in the *Mining Journal* of Sept. 28, was substantially true and correct in every particular. We do not correct this error through any ill-feeling towards Messrs. Le Gros, Mayne, Leaver, and Co., but simply that your readers may not be led astray.

London, Oct. 23.

HATHORN AND CO.

INNOCUOUS TIN-PLATES—AN ENTIRELY NOVEL PROCESS.

SIR.—The use of preserved provisions largely increasing every year, and an increase in the consumption of tin being most desirable for the welfare of mining, every effort should be made to remove any objection to the use of tin for packing purposes which may be urged. Now, the coating of metal plates or sheets with tin has hitherto been commonly effected by dipping black sheets (sheet iron) of various dimensions and thickness first into boiling grease or palm oil, and afterwards into molten tin, but according to the invention of Messrs. Neuburg and Böhm, of Vienna, the black plates are tinned without grease and without molten tin, and it is said to have been found in practice that tin-plates made according to this invention will not produce the injurious effects resulting from the grease on ordinary tin-plate, and which in many cases has led to their disuse by manufacturers of potted provisions and others, and has caused great inconvenience in cases where no convenient substitute can be found for such tin-plates, as in the manufacture of cans or tins for containing condensed milk. The black iron sheets of any desired dimension and thickness are first well pickled by dipping them into a tank containing water, with which is mingled sufficient sulphuric acid to give the liquid a density of 15° Baumé. If with the liquid of this degree the black surface of the said plates is not readily removed more sulphuric acid can be added to bring the pickle to a density of about 20° Baumé. After this operation the black sheets are dipped into clean water to remove all the acid therefrom, and are then scrubbed with the ordinary brushes, sand mixed with dissolved quicklime being used to facilitate the removal of dirt and acid from the surface of the plates. When this operation has been thoroughly performed the sheets or plates are again washed with clean water.

The next operation in the improved process is the subjecting of the sheets or plates to a galvanic current, produced either by Bunsen or other batteries, or by a magneto-electric machine. The cleaned black sheets are suspended between tin anodes in a bath herein-after described, and left under the influence of the batteries and bath for such times as may be found necessary to deposit sufficient tin on the surface of the sheets. This time will depend upon the quantity or thickness of tin to be deposited on each sheet, and can be varied as to the quantity to be produced. Great care must be taken in the preparation of the bath, which is composed of distilled water, pyrophosphate of soda, protocloride of tin, and cream of tartar. These materials are used in the proportions of 10 litres of distilled water, in which are dissolved 1 kilogramme of pyrophosphate of soda and 125 grammes of protocloride of tin. The dissolving of these ingredients is thus effected: The 10 litres of distilled water are allowed to boil; then he pours into the same about a handful of the pyrophosphate of soda, and dissolves it by continuous stirring with a glass rod.

As soon as the pyrophosphate of soda is dissolved a part of the 125 grammes of protocloride of tin is put into a fine brass sieve and suspended in a solution of pyrophosphate of soda. The sieve must remain in the boiling water until the protocloride of tin is thoroughly dissolved. This operation must be continued until the whole of the 1 kilogramme of pyrophosphate of soda and the 125 grammes of protocloride of tin are dissolved. This solution is emptied into the 100 litres of distilled water in a wooden or earthenware vessel of square or oblong shape, suitable for holding five or six sheets of black plates and the necessary anodes. If larger quantities are to be tinned at the same time the bath must be enlarged in capacity, according to the quantity of liquid required therein. Great care must be taken that the bath is always kept very clean, as dirt or dust will spoil the effect of the deposit. Cream of tartar is used only when the deposits show a greyish instead of a white colour. In using this they take 10 litres of the solution of chemicals above described, and when the pyrophosphate of soda and protocloride of tin are dissolved they add the cream of tartar by dissolving the same through the brass sieve. This solution is also poured into the bath. The black plates when dipped or immersed in the bath, and connected with the battery, will readily coat with tin. After a few minutes the coated sheets are removed from the bath and rubbed with brass wire brushes to give them a bright appearance; then they are again dipped in clean water and placed in an oven. If a very bright appearance is desired the sheets are subjected to the bath a second time, and again rubbed with brass wire brushes, and when dry they can be polished.

I think that this description of Messrs. Neuburg and Böhm's in-

vention cannot be read without its being seen that any contamination of the tin is practically impossible. The vessels made of it would preserve the provisions as free from injury for any length of time as the clearest glass, and I feel sure that tin and tin plates would come into use where before they have been considered quite inapplicable.—*City, Oct. 22.*

H. C. B.

SUPPLY OF WELSH STEAM COAL TO LONDON.

SIR.—In the depressed state of our shipping it is of the greatest importance that an alleviation in the working expenses be sought for in a reduction of the cost of smokeless steam coal delivered on board, and in an immunity from breakage, hundreds of tons of Welsh steam coal having, through trituration in a lengthened rail conveyance, breakage in falling from the shoots in Chelsea basin into the barges, and loading in the docks, been thrown overboard, and otherwise rejected, as unfit for use. The most rigorous scrutiny of my data fully bears me out in submitting to the steamship owners, colliery owners, and metropolitan consumers of steam coal, that the best qualities of Welsh smokeless steam coal can be delivered water-borne the entire distance from the pit's mouth to alongside steamers in the Thames docks and in the river, as well as alongside coal wharves on both sides of the Thames, and steamers in Queenborough, Harwich, and Dover, at 7s. a ton under the cost of transit by rail and attendant expenses, with regularity of supply and not exposed—either in decked barges on the Glamorgan-hire Canal, or in decked barges on the Thames—to the effects of the weather, from which the Welsh coal suffers so much deterioration in the great distance in open trucks and open barges under the present system of transit. The steamers will be the ordinary screw colliers, but with end to end hatchways, twelve direct-action steam-cranes, decked connecting barges at each end to load and discharge on steamships' arrival, with attendant tugs, the coal to attain immunity from breakage being conveyed in sacks.

Basis of calculation. Expense of putting the coal into sacks—identical with the *modus operandi* at the Midland and Great Northern metropolitan termini, and at coal wharves on both sides of the Thames—in decked barges, canal dues and conveyance to screw steamer insurance, Cardiff, Medway, and London port charges, lights, &c., fuel, wages, engine stores, contingencies, lighterage in Medway and Thames, sacks, filling, loading and discharging, and loading steamers' bunkers, &c., insurance of coal; per contra, rail-toll (less City dues), and trucks, lighterage, delivery into bunkers, &c., breakage; but if we only say 5s. a ton saving, with immunity from breakage, what an alleviation in the working expenses of the numerous daily departures of large steamers from the Thames. The Times, Standard, and Iron of last week adduce an instance of a household having paid for 6 tons of coal and only received 4½ tons, but steamship owners will do well to ponder over the fact of a respectable and extensive coal merchant being lately condemned to a convict prison for delivering as much as 12 tons short weight per barrelload from Chelsea basin, the terminus of the Great Western and London and North-Western Railways for steam coal transit from Wales. There is no check upon the quantity put on board steamers otherwise than trusting to the honour of the coal merchant. At foreign coaling stations in our own dependencies the coal is all weighed and tallied; and knowing the coal robberies under their own eyes no check is kept. In the Tyne the keels are weighed and marked, similar to the steamers' draught of water, which is not now the case in London. Coal merchants delivering coal to house-holders, &c., are by law compelled to carry weights and scales with their vans, whereas from Chelsea basin there is no check to robbery. By the proposed system each sack can be weighed, or a number of sacks selected to test the accuracy of the weight, each sack alike specially made to hold more than the 2 cwt. charged.

The co-operation of steamship owners, coal owners and investors generally is entreated in the constitution of this important undertaking, presenting no novelty, no invention in the proper sense of the word, but merely an application of long established ideas to appropriate purposes, dispatch in loading and discharging, eschewing the intricate navigation and fogs of the Thames by discharging in the Medway, and immunity from breakage by conveying all the way by water peculiarly applicable to the extremely friable nature of the smokeless Welsh steam coal.

WILLIAM JOSEPH THOMPSON.

6, Fitzwilliam-road, Clapham, Oct. 23.

THE GREAT NORTHERN RAILWAY.

SIR.—En résumé of my correspondence in last week's *Journal*, permit me to state that the Great Northern capital has increased 32 per cent. from 1873 to 1877, whilst their net revenue has not increased 5½ per cent., while those of the Metropolitan, weighted with three-fold higher price for fuel, are 38 per cent. The report of the Commissioners appointed to enquire into the application of iron to railways shows the effect produced by heavy loads travelling over rails at different velocities—as for instance, the awful abrasion caused by the Great Northern coal traffic at the insensate rate of speed they travel. It suffices to compare the cost of renewal of the up line, over which the coal travel, with the down line, over which the empty trucks return. Regularity of supply, not speed, is wanted in the coal supply of London. How appalling to reflect that the work done in the transport of coal has been nearly twice as fatal to human life in its character as that employed in the winning of it in the bowels of the earth. The maximum of safety in railway travelling coincides with the minimum amount of mineral traffic. The Editor of Fraser's Magazine says, "Immediate steps ought to be taken to remove coal traffic from passenger lines." The Great Northern will be made to do one or the other. By the 1878 Board of Trade Returns they had to pay 87,572 for the year's compensation. It is not too late for the Great Eastern, in lieu of supplying green peas to the colliers, and attempting to convey coal—their General Manager's evidence on March 19, being, "We cannot compete with sea-borne coal to London"—to endeavour to obtain an Act for an exclusive passenger line to the North, which will throw the whole of that traffic into their system to and from London. Internecine railway competition is so appalling that the general manager of the London and North-Western stated publicly, "In many cases wagons are sent as far as to the North of Scotland with £100 a week of goods to secure customers, and to compete with other railroads."

I shall, with your indulgence, in my next quote the Traffic Act, &c., and show the direct violation by the Great Northern of this Act. Is it not a scandalous shame that the working man and the less favoured classes of our social system, in this self-styled highly civilised country, have to submit to pay between two and three-fold the amount paid in the German empire for rail transit? The working classes, to obtain a living, must move about and the greatest evil they have to encounter is dear locomotion, which is the great cause of the deplorable state of our labour market. Almost every description of work is leaving this country: an eminent writer, in his lately published work, showing that in a country within a day's travel from London day labourers are currently in receipt of only 3d. a day of 14 hours, and 300,000 female flax spinners 10s. a week.

WILLIAM JOSEPH THOMPSON.

6, Fitzwilliam-road, Clapham, Oct. 22.

PANT-Y-MWYN LEAD MINE.

SIR.—I have hesitated to infringe upon your columns upon the above subject, seeing that so many persons have taken the matter up, to challenge the assertions of the Messrs. Watson Brothers, who in their report, published in the *Journal* of Oct. 5 have endeavoured to veil the accuracy of the brief but concise and satisfactory letter of the Secretary of the Company, published in a previous issue of your valuable *Journal*, and the majority of shareholders extremely surprised to find so respectable a firm of shareholders rushing into print upon the misrepresentations of a few malcontents, who merely form a decimal part of the total number of shareholders, and using every effort to traduce a company which possesses within its recently published annual accounts, and the rapidly-increasing development of the resources at its command (obliging a large in-

crease in the number of men employed), the best refutation of such spurious reports as the one now under notice. A reference to Messrs. Taylor and Sons, in the working of former years, is so irrelevant to the subject that it needs no comment beyond placing the writer or writers of the report in question in the position of endeavouring to escape present facts by unnecessary allusions. Messrs. Watson Brothers' agent was undoubtedly labouring under an hallucination when he arrived at the conclusion that efficient machinery has not been provided for (present) exigencies of the mine in question. (See *Mining Journal* of Oct. 19 for a correct and independent paragraph upon this point.) In all probability his want of veracity may be accounted for by inexperience amongst largely developed mining operations, and the bewildering influence thus forced upon his overstrained imaginative powers may readily have produced the result of a very imperfect, irregular, and unreliable report. But Messrs. Watson Brothers go too far when they attempt to explain the dissatisfaction which prevailed at the annual meeting of shareholders held in Liverpool, on Aug. 29. I certainly was not aware that any firm of sharedealers in England was ubiquitous, which must evidently have been the case to enable the parties alluded to become aware of what took place at such meeting (?). However, my supposition appears unnecessary, as Messrs. Watson Brothers, at the conclusion of their report, acknowledge that it was only upon hearing evidence they acted. Any barrister-at-law will, for a small fee, give them his legal opinion of the value of such evidence.

In brief, the whole report of dissatisfaction at the working of the mine is purely imaginative from whoever communicated the same to Messrs. Watson Brothers, and the recorded minutes of the proceedings of the general meeting in question can, I feel assured, be triumphantly referred to by the majority of shareholders, which is only a mere form of expression including nearly all, in support of my assertion. The grumblers are neither large nor ordinary shareholders, nor are they energetic supporters of the company's interests, but evidently decided the contrary.

VINCIT VERITAS.

Liverpool, Oct. 23.

PANT-Y-MWYN LEAD MINING COMPANY.

SIR.—Whatever correspondence and remarks may have appeared in your valued Journal from time to time for and against the above mine I am instructed by the board of directors to say that they have in no way contributed to or recognised any of the statements so made, and are not desirous that the undertaking should be unduly puffed up or adver-sely run down; they are satisfied that the mine is such as to bear scrutiny, and give shareholders a good return for their investment. With respect to the leases, I am instructed to say that we have a lease on that portion we are working, and have now the draft lease in possession for additional land.

Liverpool, Oct. 24.

E. CARVER, Secretary.

PANT-Y-MWYN MINE.

SIR.—A good deal of conflicting discussion as to the merits and the *modus operandi* adopted in conducting the underground workings of this highly interesting property has of late appeared in your valuable and widely-read Journal. In consequence, I have deemed it desirable to obtain a section, and also an independent opinion, from one of our special correspondents and resident in the district. After a few remarks founded on the section and report, I append the latter verbatim. The upper section of the main lode is opened out by two adit levels, 20 and 50 fms. in depth respectively, while two shafts are sunk from surface to 20 and 15 fms. below. Lead ore was first discovered at and about the western or Griffith's shaft at the deep adit, and held up some 6 to 7 fms., and extended east and west of the shaft some 30 fathoms. The shaft was sunk to the 10 fathom level, and the ore found to be some 60 fathoms to 70 fathoms in length, with occasional patches of poor ground. Next a 15 fm level is opened out for some considerable distance, and the vein improves in productiveness as depth is attained. This shaft is now down to the depth of 20 fms., but it seems to us rather unnecessary to open out less than 10 fm. levels, or to undertake in a lode of such promise and yield as this unquestionably is. Ninety fathoms east of the shaft referred to is Modlyn's shaft, and rich ore is just struck in the bottom. Hence the discoverers that hitherto have given such substantial yield are greatly enhanced through the recent and additional one. There are many other points of great prospective promise, and other lodes thought highly of. The distance from the western shoot of ore at the deep adit to the point of intersection at Modlyn's shaft is fully 100 fms., but in the opinion of our correspondent there are two shoots of ore, and this is highly probable, as a continuance of a rich course of ore for the whole distance would at once establish this mine a prize of first importance and character. In the section before us the reserves are valued at 240,000/-—this estimate is doubtless overstrained. We append the report of our correspondent:—

Being in the vicinity of the Pant-y-mwyn Mine on the 15th inst., I availed myself of the opportunity to go and see it. Captain Hughes was in the office, where he pointed out to me various specimens of galena and their associates extracted from the mine, which clearly represented the intrinsic value of the lode. In my cursory glance through the collection I perceived what I believed to be some silicate of zinc, but no sulphur of that sort. I mention this, as immediately afterwards I was conducted to a shaft where this latter mineral was conspicuously represented with the lead brought up the previous day from a fresh discovery. Other indisputable evidence I received of this being a distinct course of ore from that wrought from the other shaft; the character of the stuff forcibly reminded me of the West-minster and adjoining mines. In the dressing department it is evident that practical economy has been successfully studied and effectively carried out. Where such skill is exhibited in surface operations by a practical miner of Capt. Hughes's abilities it is inconsistent to believe the underground management to be defective. There was about 100 tons of clean ore dressed in the bin, which was rapidly being sent off; while at the engine shaft a large pile of stuff was accumulating ready for the floors. Since I was at the mine (about 18 months back) great progress has been made, and it gave me much pleasure to notice the animated appearance of the mine on the present occasion.

That discoveries of great importance are made no one can question, and that they exist in the bottom of the mine is most significant. That more powerful drawing and pumping machinery will be required as the workings attain depth and length is also beyond doubt. These facts should be a source of congratulation rather than regret. There is a large unissued share capital created, and, so far as the proprietary are concerned, they have only to decide between the issue of more shares or the temporary direction of a portion of their profits to the purchase and erection of all the necessary machinery and plant, so pointedly referred to as disadvantageous to the interests of the investing public. We shall be glad to learn of another young mine having 100 tons of dressed ore in the bin, and the floors well supplied with raw products.

R. TREDDINICK,
Consulting Mining Engineer.

Exchange, Coleman-street, London, Oct. 24.

MINING IN CARDIGANSHIRE, 1878.

SIR.—On Saturday last I wandered on the hills in the neighbourhood of Plynlimon, and so on Monday following, and returned to the valley of the Rheidol last evening (Tuesday), and am pleased to inform our friends, through the pages of your far-circulated Journal, my visions and opinions of mining in that district altereth not. I will begin with the GREAT WEST VAN, which property has again changed hands for about the sixth time, but this time into the hands of the gentleman who once owned it, sold it, and has again now taken unto himself that for which he at one time parted with £20,000/-, the present purchase money, being only 20,000/-, doubtless paid. The property to the west, called WEST & SCAIR-LLE, belongs to the same gentleman, so we may rest assured that the whole valley of Castell will by-and-by resound with the name and praises of Mr. Barker, of Birmingham. Long life and ever success to him and his mining properties! All that has been done on and in this mine only remains now to show what will and can be done by the proprietor and his staff. The lodes running through this district are strong and well defined, and mineral have been sold, and we can but hope that a mine of this magnitude will shortly open and re-open large deposits of mineral, for the benefit of the poor miners as well as for the deserving and plucky adventurer. The name might justify one believing this property to be in the immediate neighbourhood of the Van Mine, but such, however, is not the case, neither is it upon the same lode as the Van and other mines between the two mentioned mines, West Van, but is seen, and is in a spot where it can be worked either on surface or by communication from the other. At all events, the lodes are both there, and for what I can say to the contrary, there may be many others never as yet discovered. The lode in leaving this property goes away to the west, but north of

Esgair Lle Mine, consequently the next view we have of the lode is in the Bryn Glass Mine (through which runs the Queen's highway from London to Aberystwyth). This mine, then, I would mention, and try to show how it has been with it for the last few years; how it has been taken hold of, and again dropped time after time, and lately a good lot of machinery has been erected, things put in the form of trying to start it again in the market for a fresh coming out. Lands to the east and to the south have been added, so as to make the property worth taking hold of. Some beautiful deposits of mineral, richer by far than those of its neighbours, have been met with, raised and sold, and yet only 20 fms. deep, waiting only the coming forth of a partner with about 2000/-, or, at the furthest, 3000/-, and who, doubtless, would reap a reward, for I really think 3000/- ample to work the property. I hope to see it soon classed amongst the divided mines of Cardiganshire. As I shall be writing again next week, and have but spare time to catch this day's post, I hope your readers will pardon my closing here. Rheidol Cottage, Oct. 23.

SAMPSON TREVETHAN, C.M.E.

NEW CONSOLS.

SIR.—There are so many circumstances connected with this much-abused property which should be published that have determined me to issue a pamphlet, giving details duly substantiated. I hope to get it published by Christmas next. The readers of it will be able to judge whether the directors and secretary were honest men or otherwise.—Truro, Oct. 23.

R. SYMONS.

MORFA DU MINING COMPANY.

SIR.—I have read with great interest the letters lately published on this mine. I note also that the property is expected to become a great success, and, indeed, already claims it. By last report I read that the bottom level is looking very well, yielding the large amount of 7 tons per fathom, and that the side of the level close to the fore-breast yields good ore; this is important. It is stated that 150 to 200 tons per month can now be raised very shortly indeed. What price can be obtained for this ore? 100 tons being now ready. If any sum like a decent figure is obtained, there being 12 ozs. of silver and 3 dwts. of gold per ton, then Morfa Du Mine on a capital of 7000/- ought to clear, raising between 150 and 200 tons, cent. per cent. profit.—London, Oct. 23. SILVER ORE.

[For remainder of Original Correspondence, see to-day's Journal.]

Fleetings of Public Companies.

THE WEST PRUSSIAN MINING COMPANY.

A meeting of shareholders was held at the offices of the company, Victoria-street, Westminster, on Oct. 18.

Mr. JAMES R. STEWART, jun., in the chair.

Mr. EMILE GÄRCKE (the secretary) read the notice convening the meeting. The report of the directors was as follows:—

The directors are glad to be able to report that the output at the various mines has considerably increased during the past twelve months, while at the same time the cost of production per ton has been reduced by nearly 10 per cent.; owing, however, to the further serious fall in the price of metals, there has been no increase in the profits over those of the previous year. It will be seen from the manager's report that, owing to this fall in price, the sales of lead ore have been realised on the average 2/- per ton less than last year, causing a diminution of profits of over 8000/- Under these circumstances the directors are of opinion that, as far as concerns the general soundness of the undertaking, the results of the year's work ing must be considered satisfactory.

The directors have made careful enquiries as to the cause of the present unprecedentedly low price of lead, which now stands lower than it has been at any time during the pre-ent generation, and they have learnt with satisfaction that it is considered by the best authorities on the subject that the present depression is due solely to diminished demand arising from the general stagnation of all trades, and not to causes, such as new discoveries or largely increased production, which would tend permanently to reduce the value of the metal.

For details as to the present state of the several mines and the works carried on during the year the directors beg to refer to the report of the manager.

The gross profits for the past year, including 3890/-, were brought forward from last account, amount to 16,716/- 17s. 9d., and after deducting all current expenses and interest, there remains a balance of 13,373/- 14s. 1d. Of this sum 4400/- has been paid to the preference shareholders in discharge of their preferential dividend of 8 per cent. for the year; and 4200/- to the A shareholders, being at the rate of 3 per cent. for the year upon the capital represented by these shares.

Of the amount remaining over on profit and loss account, the directors propose that a further sum of 2000/- be placed to reserve fund, and that the balance of 2773/- 14s. 1d. be carried forward to next account.

The directors who retire by rotation are Messrs. James R. Stewart, jun., and Albert A. Wynne, who, being duly qualified, offer themselves for re-election. Mr. E. Woodring, the auditor, also retires and offers himself for re-election.

The CHAIRMAN said that before putting the usual resolution to the meeting he had a few observations to make. He, however, had very little to add to what was in the report, and the very clear statement of the manager. The directors were glad to be able to report that the output of the various mines had been considerably increased, in fact the figures showed that they had increased from 3600 tons last year to about 5000 tons this year, and that would have been considerably larger but for the great fall in the price of lead, which prevented them from treating the poorer class of ore. The cost of production had been reduced by nearly 10 per cent., and this was mainly owing to the untiring exertions of their manager on the spot. This saving amounted to nearly 3600 marks (or 180/-) per month. He thought on the whole they might congratulate themselves on the result of the year's working. There was only one drawback, and that was the great fall in the price of the metal. During the past two years there had been a fall of nearly 4/- per ton. When the started lead was at 22/- or 23/- a ton; but last year it was only 18/-, and, taking into account the stagnation which affected the produce of the ore as well as its actual price, they had been at a loss of 4/- per ton, or 16,000/-, which would have almost trebled their profits. Between this year and last the fall in price had been about 2/-, or 8000/- loss to the company as the result. He believed the shareholders would agree with the directors in thinking that, as regards the general soundness of the undertaking, the results of the year's working had been very satisfactory. They had made careful enquiries from some of the best authorities on the subject, who were of opinion that there was no reason in the way of over-production for this fall in price, and that it was solely due to that stagnation in trade from which Germany as well as this country was suffering. The gross returns for the past year, including the amount carried to reserve, were 16,716/-, and after deducting the current expenses and interest, 13,373/-, the amount paid to preference shareholders (4400/-), equal to a dividend of 8 per cent. and 4200/- to the A shareholders, it was naturally their anxiety to increase the amount of the reserve fund for the reason that the payments made to them were for bills at three months' date. Consequently, unless they discounted those bills, which could only be done to a certain extent, they were three months in arrear. Their monthly payments reached about 3000/-, so that they amounted to 9000/- before the bills came to maturity. Consequently it was very necessary that they should have a reserve fund to fall back upon, not only for this purpose, but also in case of emergencies of other kinds. This was especially the case now, seeing the great depression in trade. There was a balance to profit and loss account of 473/-, and they had recommended that a sum of 2000/- be placed to reserve, and that the balance be carried forward to the next account. Of this balance more than one-half was locked up in ore and materials at the mine, so that practically they had only to deal with about one-half the amount which they had recommended to be placed to reserve fund. They had reduced their stock of ore on hand by passing it through the dressing works, and reduced it not only in quantity but, in the balance sheet, in price, on account of the present low price of metals. He (the Chairman) concluded by moving the adoption of the report.

Col. WYNNE seconded the motion.

Gen. WYNNE said that one great element of success for the company would be the disposal of some of their ironstone mines. Was there any possibility of that occurring?

The CHAIRMAN said they had had enquiries from two parties within the last two months relative to the iron mines. The board thought it very desirable, if they could, to sell some of their ironstone mines, and in order to facilitate that operation they had spent a small sum in opening up a gallery into Froesch during the last few months. As to the purchase price, they had asked 12,500/- for the Froesch and some outlying concessions. For the other mines they had asked 12,500/- or 25,000/- in all. Of course before concluding the sale the directors would ask the sanction of the shareholders. This would afford ample working funds, and free them from the necessity of putting by a reserve, which they felt it their duty to do at present.

The motion for the adoption of the report was then carried unanimously.

The re-election of Mr. Stewart as a director was proposed and carried unanimously, and a similar motion was passed to Mr. Albert Wynne.

Mr. Woodington, the auditor, was re-elected, and the meeting closed with a vote of thanks to the manager, the directors, and the Chairman.

GLYN LEAD MINING COMPANY.

The ordinary general meeting of shareholders was held at the Guildhall Tavern, Gresham-street, on Thursday,

Mr. ADAM MURRAY, F.G.S., in the chair.

Mr. JAMES COOPER (secretary *pro tem.*) read the notice convening the meeting, and the minutes of the last meeting, which were confirmed. The minutes of the committee meetings were also read.

The directors' report and accounts were taken as read.

The agent's report was read, as follows:—

Aug. 30.—Underneath you have particulars of work carried out in this mine during the last 12 months, which, I hope, will be perfectly understood by all interested. Owing to the difficulties which arose through the decease of the late secretary, who was also managing director, although work has been constantly carried on, it has been on a limited scale. Mr. Thomas, one of your local colleagues, was very anxious to develop the bottom 50 fm. level west, and for that purpose he has supplied all necessary funds. The 50 fm. level has been driven about 85 fms. from the engine-shaft, chiefly on the north part of the lode, particularly the last 40 fms. explored; hitherto the lode has been in various places disordered, by a pressure of Cambrian sandstone, dipping into it from the eastern section of the mine. It seems we have now driven beyond its influence, inasmuch as the drivage has now penetrated a different channel of ground, consequently the matrices of the lode are improving, and consist of congenial vesuvite, carbonate of lime, a little sulphur, and spots and strings of blende, which are highly congenial to the production of lead. Judging from appearances, it is my opinion, which is enjoyed by others, that we shall by extending the level soon strike a course of lead that will be satisfactory to the proprietor. Still it must be obvious to those that understand this locality that our greatest chances for permanent success lay in the development of the property at greater depths, an example will be found in the Van Mine, which is on the same line of lode, and contiguous to the Glyn Mine. I may here add that, that part of the lode standing south of the level has not yet been tested by cross cut, but that will be done when we have driven a few fathoms further west, when we believe we have the greatest chance of finding lead of importance. The ground above and below the 15 fm. level east is almost intact, but being so near the surface, and on account of the sudden fluctuations it would be subject to, it would be venturing an opinion to estimate the number of tons of lead that may be raised there. We have sold two parcels of ore, and have a small quantity at surface and underground. The steam-engine and other machinery and pitwork are in perfect order. In addition to this I have lately, under the direction of Mr. Thomas, erected a powerful Fan air-machine, which is driven by a strap from the steam engine, and sufficient air forced through large pipes fixed in the shaft and levels to thoroughly ventilate the mine in all directions. I sincerely believe that further development will be crowned with success.—JAMES ROACH.

The CHAIRMAN said: With regard to Capt. Roach's report, which had been circulated amongst the shareholders, he had read that document very carefully, and he considered it to meet the points of the case remarkably well. He would have preferred that their esteemed friend, Mr. William Thomas, should have taken the chair on this occasion, as he had taken such an energetic interest in the welfare of the company. If Mr. Thomas had not considered it worth his while, judging from his knowledge of the mine, it was not likely that he would have done what he had to bring about the amalgamation. Mr. Thomas being the local director, and having found the money to carry on operations, had ordered the driving of the 50, and this had now been driven 55 fms. between the two mines, his great object being to form a communication between the two mines at the deep adit of Van Consols. By forming this junction the ground above would be easily and thoroughly drained without the assistance of the Glyn engine, which had been a matter of considerable expense. They would also be able to drive the levels simultaneously, and the communications at the other levels could be effected in much less time. Probably it might be suggested by-and-bye that boring machinery might be employed, so as to develop the mine in a short space of time. Without doubt they would be able to stop the greater part of the expenditure at Glyn, as the machinery over Murray's shaft at Van Consols would enable them to sink another shaft in new ground. From Capt. Roach's report the shareholders would see the workings were within a very short distance of the termination of the hard grit, or volcanic rocks, to which reference had been made at previous meetings of the shareholders. This grit rock was now dipping away very strongly, and the stratification Capt. Roach was at present working in seemed to be the precursor of considerable wealth—wealth which had already been discovered in the bottom of the Van Consols Mine. As so much had been written and spoken about this mine, he did not think it would be necessary for him to offer any further remarks on the mine.

Mr. COOPER remarked that as Mr. Thomas had found the money to keep the work going at the mine perhaps the shareholders would like to hear a few words from that gentleman. (Hear, hear.)

Mr. W. THOMAS said he fully endorsed all that Capt. Roach had said about the mine. He did not believe in making glaring reports of what, perhaps, might not be carried out. They had had too much of that sort of thing in these mines, and he would rather under than over estimate the value of the property. However, if he had not confidence that better things would follow than were indicated in Capt. Roach's report he would not have found the money he had to continue the operations. (Hear, hear.) He (Mr. Thomas) then moved the reception and adoption of the report and accounts.

Mr. J. A. TALBOT, in seconding the motion, said he would like to ask whether Mr. Thomas could not give any further information than that contained in Capt. Roach's report, in which it was stated—"Judging from appearances, it is my opinion—which is enjoyed by others—that we shall by extending the levels soon strike a course of lead that will be satisfactory to the proprietor." Now, probably Mr. Thomas, to whom the thanks of the shareholders were most justly due for the able manner in which he had assisted the company, would be able to give them a rather more definite idea than that expressed in Capt. Roach's report. Captain Roach simply spoke of "a little sulphur and spots and strings of blende," but nothing was said as to the probability of their being able to find lead. They had been told from time to time that lead had been seen and bunches found, and he thought the shareholders might be told something to encourage them, for he was quite sure that anything Mr. Thomas told them might be implicitly relied on, though there might be too little as well as too much said on a subject.

Mr. THOMAS replied that there was a good prospect that a portion of the mine could be worked at a profit even at present prices, but he had not thought it desirable to pull the lead out. He preferred to leave it where it was, that anybody might see it, but there was lead in the mine which would pay for working. (Hear, hear.) The accounts showed there had been some small sales of ore, realising 22/- 10s. 7d.

Mr. TALBOT thought the information elicited by his question was very satisfactory. (Hear, hear.)

The CHAIRMAN remarked that Capt. Roach was anxious to cross cut to the south part of the lode—for the lode was 40 ft. wide; but Mr. Thomas would not allow it to be done, preferring to form a basis for future operations to any immediate discovery of ore, upon which flimsy reports might be made. By cross cutting small courses of ore might have been intersected, but Mr. Thomas preferred to go with the development of the mine systematically.

Mr. COOPER, in reply to a question, stated with regard to the item of 2000/- 9s. 1d. entered as due to the late secretary, that was subject to a claim for a much larger amount, and for which a claim against the estate of the late secretary had been made. Until the arrangements as to the shares were completed this item would have to appear on the debit side of the accounts.

The reports and accounts were then

thanks was passed to the Chairman, and the proceedings of the ordinary meeting then terminated.

An extraordinary meeting of shareholders followed, Mr. MURRAY again presiding.

Mr. COOPER (*secretary pro tem.*) read the notice convening the meeting.

Mr. COOPER then read a contract dated the 10th instant between Messrs. William Sturge, Edward Tomkies Sturge, Anthony John Norris, Lewis Lewis, William Francis, and Pryce Jones of the one part, and the company of the other part. This contract had for its object the effecting of what was before sought to be secured under a scheme for the amalgamation of the Van Consols and Glyn Companies.

The CHAIRMAN said the shareholders would have heard from the contract which Mr. Cooper had read a full and clear statement of the process by which the amalgamation was to be carried out, and he would simply draw attention to the first resolution, of which notice had been given to the shareholders.

Mr. A. E. FRANCIS proposed "That a contract dated the 10th day of October, 1878, and made between William Sturge, Edward Tomkies Sturge, Anthony John Norris, Lewis Lewis, William Francis, and Pryce Jones of the one part, and the above-named company of the other part, be and the same is hereby confirmed, and the directors be and are hereby empowered to carry out the same." As a very large shareholder in both mines, it was evident to him that unless these gentlemen had come forward at the particular time with such valuable assistance, especially in the way of money (which at present was a very scarce commodity), the property would have been utterly lost—(hear, hear)—and he thought they should not as business men, feel comfortable unless they rewarded them in some way for the trouble and risk they had taken. (Hear, hear.) Some substantial reward should be given to these gentlemen, not in the shape of money, perhaps, but when the company was properly established he thought they might allot them 1000 £ shares. Only for them the property would have been lost. It had been in their hands a considerable time, and had they been so minded they could have made large personal profits by selling the mine at double what they were now going to give for it. (Hear, hear.) Mr. Thomas had besides advancing money spent many weeks in London on the business of the company, and he hoped that some means would be devised for carrying his suggestion out.

Mr. J. A. TALBOT had much pleasure in seconding the motion. So far as they were informed in the country, the property proposed to be purchased was worth 5000£.—with the condition that the amalgamated company should pay the debts of the Van Consols Company so far as the 5000£ would not extend. Of course the property was there, and if they bought it they must take its liabilities with it, but he thought all would agree with him that they were making an exceedingly good bargain. Mr. Francis had told them that the vendors in this case (who were the purchasers from the liquidators for the sum of 5000£) might have made a large personal profit, but that was hardly a correct way of putting it. They bought as trustees, and fulfilled their duty by signing this contract. He quite agreed with Mr. Francis that, having saved the company as they had, they should by all means be recompensed by the shareholders. They did not ask for any remuneration beyond the ordinary interest on their advances, and some substantial recompence of their services should be made if Mr. Norris or Mr. Winser could devise the means for doing so. They had advanced 5000£, especially for the benefit of the Glyn Company, and he did not know any other gentleman who would have made the same sacrifices and taken the same risks as they had, and therefore he fully agreed with Mr. Thomas that, if possible, a number of shares should be allotted to them. Coming back to the real question—the adoption of the contract—nobody with any interest in the Glyn Company could refuse to agree to the contract, which was all in their interests. Numbers of people would buy Van Consols for a larger sum, and therefore if they secured it for themselves at the prices they had they should not hesitate about accepting it. He was told that the machinery at Van Consols cost over 12,000£, and that the works which had been carried out there, and he believed that by possessing such a property the amalgamated company would soon be a dividend-paying concern. He believed Van Consols would become the most valuable part of the amalgamated companies' property, and that in a very short time it would become more valuable than any mine in that part of the country.

Mr. J. C. BOLTON, in supporting the motion, said as one of the Van Consols committee, and as one of the promoters of this amalgamation, he could, for the committee, say they considered the scheme an eminently fair one for both sides. (Hear, hear.) He also wished to point out, in order that it should not be thought that the property had been acquired for a smaller sum than should have been paid, that the shareholders in the Van Consols Company would inherit by the amalgamation a full half share of the profits arising from the two mines. (Hear.)

Mr. WINSER remarked that the scheme devised was the best that could be made, but of course 5000£ did not represent what the Van Consols purchase would really cost the amalgamated company, for there were the debts and liabilities of the company to be met.

The motion was then carried unanimously.

Mr. BOLTON moved the following resolution:—"By way of compromise, or in satisfaction of the claims of the persons now claiming to be holders or transferees of shares in the company under documents purporting to be transfers thereof, executed not by the persons actually holding the shares thereby purporting to be transferred, but by other persons, and alleged to have been registered, certified, or otherwise recognised by or on behalf of the company, the directors may issue to such persons respectively the same number of shares in the company as fully paid up, without any payment in cash therefor." He heartily concurred in the remarks as to the indebtessness of the company to those who came forward and saved the company, and it would give great pleasure to himself and his friends to see in anything towards rewarding those gentlemen for what they had done. (Applause.)

Mr. J. D. DAVIES, in seconding the motion, said that the local shareholders were strongly in favour of recognising the assistance rendered to the company by the shareholders who had come forward.

The motion was carried.

Mr. ARTHUR BOLTON moved—"That to provide a sufficient number of shares to enable the directors to give effect to the last preceding resolution the nominal capital of this company be increased by the addition of a sum of 2000£, to be divided into 1000 ordinary shares of 2£ each, beyond the present registered capital of 20,000£, and that such new or additional shares be considered as part of the original capital of the company, and be subject to the same provisions as the original shares, and entitled to rank accordingly as well for payment of dividend as for all other purposes." With respect to the question of giving shares to the gentlemen who had come forward, it would be impossible to give them original shares, but their preference shares not having been fully subscribed for he thought there would be nothing to prevent the shareholders in giving some of them to those who had so nobly come to their assistance. (Applause.)

Mr. RUSSELL seconded the motion, which was carried.

The CHAIRMAN stated that it would be necessary to confirm these resolutions, and a special meeting for the purpose would be called as soon as possible.

Mr. E. T. STURGE, on behalf of his brother and his friends, thanked the shareholders for the kind manner in which their services had been referred to, and said such an acknowledgement was all the reward they desired. (Applause.)

Mr. A. E. FRANCIS proposed a cordial vote of thanks to Mr. William Thomas for the great exertions he had made for the benefit of the company, for besides advancing 1000£, to Glyn, he had given an immense amount of time to the company.

Mr. STURGE seconded the proposition, and gladly testified to the earnestness with which Mr. Thomas had dealt with the matter, and to the generous manner in which he had acted throughout.

The CHAIRMAN having endorsed the remarks of the mover and seconder the proposition was carried with acclamation.

Mr. THOMAS briefly returned thanks, and said he would always be pleased to do all he could for the company.

On the motion of Mr. TALBOT, seconded by Mr. PRYCE JONES, a vote of thanks was passed to the Chairman, and the proceedings then terminated.

WHEAL UNY MINING COMPANY.

A special meeting of shareholders was held at the offices of the company, Austin Friars, on Tuesday.

Mr. R. McCALLAN in the chair.

Mr. J. HICKEY (*the secretary*) read the notice convening the meeting, which stated that the meeting was called for the purpose of confirming the resolution passed at the ordinary meeting on the 14th inst.—"That the following gentlemen—Messrs. J. Hickey, W. Pike, and W. Rich be authorised to purchase the materials of the Wheal Perseverance Mine for the sum of 1250£, and that the same be assigned to Messrs. J. Hickey, W. Pike, and W. Rich as trustees on behalf of the company, and that the company do indemnify the said Messrs. J. Hickey, W. Pike, and W. Rich from all personal liability in connection with such purchase whether to the lords under the sets or otherwise."

In reply to a question, Mr. HICKEY said the terms upon which the Wheal Perseverance property would be obtained were, without doubt, moderate. It was absolutely necessary to the existence of Wheal Uny that the pumping-engine at Wheal Perseverance should be kept going to keep down the water owing to the stoppage of some of the surrounding mines, and in consequence of this they had kept the engine at work during the past year.

Mr. RULE remarked that on every ton of tin raised at Wheal Uny at the present price, they were losing no less than 7/- 10s.

Prof. M. H. N. STORY-MASKELYNE, M.A., F.R.S., said he thought the time had arrived when the adventurers should consider whether instead of extending their liability by the purchase of the Wheal Perseverance property they should not cease operations altogether under the existing circumstances of the metal markets. Being the keeper of the mineral department of the British Museum, and a metallurgist by profession, he had frequent opportunities of ascertaining the actual position of the tin trade, and he could certainly see no prospect of any tangible improvement in the price of that metal, and it was, therefore, a question whether by continuing operations they would not be throwing good money after bad. He was prepared to believe Wheal Perseverance pumping-engine was necessary if they determined to go on with the development of Wheal Uny, and that as a mine theirs was one of the most promising in the county. But it was not to be expected that Cornwall, where tin

could only be produced by an elaborate process of art, would be able to compete satisfactorily with Nature's own work in Queensland and Tasmania, and it was useless to disguise from themselves the fact that the days of Cornish tin-producing prosperity were at an end. That was his opinion, but he was quite prepared to go on for a time if it could be shown that there was any chance of getting any good out of the mine.

Mr. ARTHUR asked what was the loss on the last four months working?—Mr. HICKEY replied that it was about 1330£. The purchase of the Wheal Perseverance property, if decided upon, would have to be met in three instalments—450£ on the completion of the purchase, 400£ at four months, and the remaining 400£ at eight months.

Mr. ARTHUR asked what call the committee contemplated making?—The CHAIRMAN, in reply, said to meet the debit balance and the first instalment of the Wheal Perseverance property, a call of 8s. 6d. per share would be required, which would realise 1740£, or 40£ less than the sum actually required to meet those two payments in full. In any case the debit balance must be met. He believed that no effort had been wanting on the part of the management to make the mine a success.

Mr. RULE said his impression was that they would see better prices for tin shortly. The shipments from Australia had fallen off, while the consumption was increasing. Cornwall had seen times nearly as bad as the present, and he thought with a larger employment of boring machinery, and a little more economy in the working, they would be able to hold their own. With tin at 45£ Wheal Uny would do very well indeed, and he thought they would be able to meet costs in a short time. Of course, if it were certain that they were not to have better prices than those now ruling, the sooner the whole of the Cornish tin mines shut up the better.

Mr. THOMAS was unwilling that the mine should be abandoned while there was a chance of an improvement in tin. Of course any shareholder who wished to get rid of his liability could do so, as theirs was a cost-book mine.

Mr. ARTHUR suggested that they should work on for another four months, and then, if things had not by that time improved, that they should seriously consider the question raised by Professor Story-Maskelyne. (Hear, hear.)

Mr. RULE remarked that some years ago Dolcoath was very nearly stopped, but by a little perseverance it was brought into a very prosperous condition, and the shares in South Frances could ten months ago be got for as many shillings as they were now worth pounds.

The CHAIRMAN said Australia could not produce tin to pay them at the present prices, and Mr. Rule observed that a great deal of money had been lost in tin mining in Australia. There was still a little hope for Cornwall.

Prof. STORY-MASKELYNE said if money had been lost by tin mining in Australia it was from injudicious management, for the tin was there in abundance nearly all over the continent, and the freights to England had been exceedingly low. However, having ventilated the subject he was quite prepared to agree to Mr. Arthur's suggestion that they should go on with the operations until the next four-month meeting.

On the motion of Mr. ARTHUR, seconded by Mr. RULE, the resolution passed on the 14th instant with respect to the purchase of the Wheal Perseverance property was confirmed.

On the motion of Professor STORY-MASKELYNE, seconded by Mr. ARTHUR, a call of 8s. 6d. per share was made.

The meeting then terminated with a vote of thanks to the Chairman.

WHEAL AGAR.—At the general meeting of shareholders held at the office of the company yesterday (Friday), Mr. John Weston in the chair. The accounts ending Sept. 28, were produced, showing a balance due to the bankers of 365£ 18s. 8d., and an estimated balance against the mine of 4101£ 7s. 10d., to meet which a call of 10s. per share was made, and the committee were authorised to dispose of and realise the forfeited shares at such times as they may deem desirable. The report of Capts. Hamble and Moyle was read. Taking into consideration the depression in the tin market, the shareholders present expressed their satisfaction at the accounts now presented to them, as it is evident that with a better price for metal there will be no difficulty in making the returns equivalent to the cost for the future. The prospects of the concern are most cheering, and as every economy is exercised in the development of the mine, and in the purchase of materials, the shareholders may feel confident that their interests are being well looked after. Since the last meeting 2827 tons of tin-tuff have been sold, realising in the stone about 5200£, but which only two years since would have produced something like 8300£, and enabled the company to divide a profit.

SOUTH WHEAL CROFTY.—A special meeting of adventurers was held at the mine on Monday, Mr. H. J. Lean (the purser) presiding. A large number of shareholders were present. The Chairman said they all knew they were in a very difficult position at the present time. The price of tin was down, and they had been sustaining heavy losses, so much so that some of the adventurers had sent in their relinquishments. Some of the shareholders, however, were desirous of going on working the mine. It was thought by the manager (Capt. Josiah Thomas) that if the salaries were reduced, and the water merely pumped out, it would not cost more than 100£ a month just to keep it going. There would probably be a loss of 30s. per share a month, in the meantime, if tin went up they would very likely receive a benefit from it. Another suggestion had been made, which was that they should do a little more than pump the water out. They had a good hole unexploded, but of course, if they went further it would entail the outlay of an additional 100£ a month, and a loss of 3/- per share. Capt. Josiah Thomas (the manager) stated that they intended to drive west of the 205 cross-cut, where they had not seen the lode since they had cut it. They had driven the cross-cut south and cut a part of the lode, which contained some tin. It seemed to be a well-defined lode and by sinking about 5 fms. under the lode the other two parts would fall in with that part. He should think they would fall in with some good tin. The lode was wide and scattered, and exactly similar to that in East Pool. It was scattered over 30 ft. of ground, but if it were concentrated into about 12 or 15 ft. he thought it would be much better. He believed it was getting more concentrated as it advanced. With regard to the pumping engine for pumping he supposed it could be done for 10/- a month, but they would not be pumping everything that it would be a pity to pump alone. He thought that if they confined attention simply to bring the 205 level west, or sinking under the 205, it would not cost more than 200£ a month. It was, however, for the adventurers to consider what they would do, but he had merely given his advice on the matter.—After some discussion it was resolved that the operations for the present be confined to the 205 level at a cost, including the working of the engine, of 20/- a month. It was also resolved that application be made to the lords of the mine for the remission of the dues during pleasure, and that the salaries of the working staff be reduced from 55/- 14s. to 22/- 1s.

JAVALI COMPANY.

The following report from the directors, for the six months ending June 30, will be submitted to the meeting of shareholders on Monday:—

The directors have to report that 11,163 tons of ore, producing 9300£, were crushed during the first six months of 1878, against 8795 tons, producing 6402£, in the corresponding months of 1877; whilst the average value realised from each ton was 10s. 8d., against 14s. 7d.

The work at the mine during the period under review has been carried on with steadiness and regularity, and therefore the directors have confirmed the appointment of Messrs. Hennecke and Chambers as joint managers.

Although the accounts are not made up for these half yearly meetings, yet enough is known of them to enable the directors to state with confidence that, in addition to the debenture interest, a clear profit has been made during the six months exceeding 13 1/2%; and they consider this result sufficient to justify them in the belief that something may soon be done towards redeeming a portion of the company's liabilities on debentures.

The directors have taken legal advice as to whether the preference shares, with their heavy accumulating interest, could be purchased on terms to be mutually arranged between the board and the individual holders; but they regret to say that there are many difficulties in the way, and for the present the project must be adjourned.

LIMITED COMPANIES AND MORTGAGES.—The fact that a legal opinion has been given to the effect that a mortgagee can "foreclose" his mortgage—that is, withdraw his money before the expiration of the period for which it was lent—has attracted considerable attention among Oldham limited companies. A number of persons interested in the question determined to consult a high legal authority on the subject. A barrister on the northern circuit was accordingly consulted, and he has given it as his opinion that no mortgagee could in such circumstances foreclose his mortgage, be-

cause it would be contrary to law and equity. He added that no one would be safe if such a power existed, because a mortgagee might deem his loan in danger upon the merest supposition, and thus produce a disaster to the concern which had borrowed his money. This assurance has given great satisfaction to limited company people, who think that it is a more common-sense view of the matter than the other.

Registration of New Companies.

The following joint-stock companies have been duly registered:—

ST. MALO STEAM SHIP COMPANY (Limited).—Capital 100,000£, in shares of 25£. To purchase, build, charter, equip, and trade with steam and other ships, boats, and vessels of all kinds. The subscribers (who take one share each) are—Isaac Kay, Manchester; Aaron Brown, Liverpool; J. Hurst, Manchester; W. G. Barnes, Liverpool; J. Bowker, Manchester; Edward Trigg, Glasgow; H. C. Stone, Liverpool.

PATENT VACUUM CHIMNEY TOP AND VENTILATOR COMPANY (Limited).—Capital 7000£, in shares of 5£. To acquire the Letters Patent granted unto Henry Melville Williams, and any other patent for the same invention, or concessions for the United Kingdom or elsewhere, and to carry on the business of engineers. The subscribers (who take one share each) are—R. Elzenberger, Midland Hotel; E. G. Hardingham, East Mousley; C. A. Paterson, Midland Hotel; H. R. Bottom, Midland Hotel; H. S. Roberts, Brixton; H. M. Williams, Highbury; H. Brown, 7, Walbrook.

THE PHOSPHATE COMPANY (Limited).—Capital 10,000£, in shares of 100£. To adopt and carry into effect an agreement between P. Tarbutt and C. Quentin on the one part, and J. T. Hall on behalf of the company, of certain rights held by the said P. Tarbutt, of working and extracting apatite and other minerals, situate in Norway or elsewhere. The subscribers are—G. A. Quentin, Cheltenham; J. G. Gutteridge, London; 2; F. Leach, Kensington, 5; T. W. Rae, Enfield, 4; A. Tarbutt, Streatham, 2; C. Quentin, Cheltenham, 1; P. Tarbutt, London, 2.

PASSENGERS' AND GUARDS' COMMUNICATION COMPANY (Limited).—Capital 3600£, in shares of 10£. To carry into effect an agreement made between H. Morris, Manchester, and A. M. Blair, for the purchase of certain Letters Patent for signalling railway trains. The subscribers (who take one share each) are—A. Henderson, 26, King William-street; C. Wyndham, London; J. Kemp, 7, Jermyn-street; Annie Pease, 33, Upper Bedford-place; H. B. Farne, 35, Great Marlborough-street; D. M. McDonald, 51, Lincoln's Inn; A. E. Lewis, 8, Great Barlow-street.

MINERAL RESOURCES OF CONSTANTINOPLE.

The district of Constantinople, says Vice Consul Wrench, abounds with mineral wealth. The copper mine of Sari-Yeri, on the European side of the Upper Bosphorus, 15 minutes' walk from the place of shipment, is the nearest mine to the city, and it affords a striking instance of the danger to European capitalists of embarking in mining enterprises in Turkey. It was formerly worked by native owners, in a rude and primitive manner, owing to which it produced no profit, and was finally abandoned. So great is the positive discouragement not to say hostility, manifested by the Turkish Government to mining enterprise, that none but the most venturesome and persistent will venture to cope with the almost insurmountable obstructions, and the vexations and protracted formalities, placed in the way of all who attempt honestly to turn the mineral resources of Turkey to account. Nevertheless, it is but fair to add that a set of Levantine speculators exist, whose only object in life seems to be to encourage, by their intrigues, the Government in its determination to allow no foreign subject to work a mine in Turkey.

Thus, although, even in the vicinity of the Bosphorus, there are many indications of the presence of copper, silver, lead, iron, and manganese, no one has ventured to disturb them. Fire-clay, china-clay, Portland cement stone, alum stone, gypsum, red and yellow ochres, as well as lignite of fair quality, also exist near Constantinople, but their existence is known to but few, and they have been almost wholly neglected. The only local productions from beneath the surface of the ground consist of bricks and tiles of superior make, some lime and quarry stones, but even here the quantity produced is insufficient to supply the local demand, and, with regard to bricks and tiles, it is found cheaper, or, at all events more satisfactory, to bring them from Marseilles or Trieste.

Iron ores are especially abundant in the neighbourhood; outcrops of lodes of the red hematite class occur in two of the Prince Islands, and at Pendik, on the opposite mainland; and of the mica-schist class, near Mont Alemdagh, and near Beicos on the Upper Bosphorus. Judging from several analyses of the iron ores from different parts within a radius of 150 miles from the city, it appears that they are fairly rich in metal, and in some cases remarkably so, as they contain from 48 to 57 per cent. of metallic iron, and one analysis shows even 63 per cent. They are especially valuable on account of their remarkable freedom from phosphorus and sulphur. In fact, the reports of analyses made by the eminent Dr. Noad and other scientific authorities will show that some of the samples of ore did not give the slightest trace of these or of other substances detrimental to the quality of the iron. It is stated upon competent authority that ores of this degree of purity are unknown in other countries, and that it is thus explained why the natives in some parts of Turkey succeed, even with their primitive furnaces, to produce the finest steel and iron. The iron bars made at the Samakow furnaces, in the Balkans, possess a local renown that secures for them double the price of English bar-iron at Philippopolis and Tatar Bazardjik, and a similar state of things exists with regard to the cutlery of Cape Baba. In addition to producing better metal, on account of the absence of sulphur and phosphorus, the Turkish iron ores possess the advantage of not requiring calcination previous to reduction, or puddling subsequent thereto.

Recent explorations have resulted in the discovery of extensive coal fields to the westward of Heraclea, towards the river Sakaria, and also to the eastward of Amassera, towards Ineboli. A few years

of the Imperial coal fields coal has been recently discovered, commencing from near the port of Unié and extending twenty miles inland. The coal has a great resemblance to Cardiff, but in one place anthracite of exceptional quality has been found. The value of the discovery is further augmented by the proved existence of powerful lodes of hematite iron in the neighbourhood of the coal, and by the fact that practicable roads lead to the sea coast. Here also, as in many other of the mines of Turkey, the lodes crop out from the sides of hills, consequently the winning of the coal and iron, and the draining of the mines, are rendered easy and inexpensive, for deep shafts and costly pumping machinery may be dispensed with. Vice-Consul Wrench remarks, in conclusion, that with every advantage of climate, of soil, of material productions of the most varied kinds of geographical position—with virgin forests and with abundant mineral wealth—Turkey would, under an enlightened Government bid fair to rival half the world in productive wealth.

FOREIGN MINING AND METALLURGY.

The Iron Trade has presented comparatively few features of interest at St. Dizier; for the moment business is very restricted in the St. Dizier district, and prices are weak. The offers made by intending purchasers are often of such a character that it is necessary to refuse them. Good iron from coke-made pig is quoted at 6d. 12s. to 6d. 16s. per ton, and mixed iron has made 7d. 12s. to 8d. per ton. In the Nord the week has not been a very bad one, several contracts having been concluded. Current transactions of some little importance have been concluded at 6d. to 6d. 2s. per ton. In the Loire-Rhone only a very restricted business has been passing in merchants' iron. Producers of fine iron in France are suffering extremely from the importations which take place from Sweden and Germany. As regards pig of superior quality for refining, there is also considerable competition on the part of the Westphalian products. The Administration of the French State Railways has let contracts for 25 locomotives to the Fives-Lille Company at 1580/- per six-wheeled locomotive, with 320/- for the tender, and at 1704/- per four-wheeled locomotive. The Châtillon Commeny Company has just obtained a contract for the armour-plates required for the *Fusanne*; the weight of these plates is 1000 tons.

The week which has just elapsed has formed a very quiet period in the history of the Belgian iron trade. The rolling mills producing merchants' iron have a sufficient number of orders on hand, and the works producing plates, especially those which turn out special marks, are well provided with orders. As regards the Belgian mechanical construction establishments they have still work assured to them for some time to come. Prices are generally reduced to an extremely low point. There are vague rumours that some orders for rolling stock are likely to be received in Belgium on Australian account. The Providence and the John Cockerill Companies each give their shareholders 5 per cent. for the past year; the John Cockerill Company is also forming considerable reserves. The Monceau-sur-Sambre Blast Furnaces Company gives a dividend of rather more than 9 per cent. upon its capital. Amongst the mechanical construction companies the Wilbroeck Company distributes 2 per cent.; the Haine St. Pierre Central Construction Company 10 per cent.; the Belgian Railway Plant Company 5 per cent., &c. Having regard to the intensity of the crisis through which Belgian mechanical and metallurgical industry has had to pass, the results disclosed in Belgian companies' reports are not unfavourable upon the whole.

The different French coal mining centres are as quiet as those of Belgium and Great Britain. There is a certain activity in the demand for domestic qualities of coal, but, of course, this circumstance is usually noted at this period of the year. As regards prices, they appear to be as feeble as ever; if possible they are the turn in favour of intending purchasers. A prominent question in France just now is the improvement of means of transport, and in connection with this subject it may be noted that a commission formed for the construction of the great canal of the Nord is meeting frequently. A decree of the French Minister of Public Works has just created a special service for the prosecution of surveys of a canal from the Meuse to the Sambre and the Escout.

Notwithstanding that the weather has not been very cold at present in Belgium, orders for domestic qualities of coal are arriving tolerably freely at the various Belgian centres of production. The sugar-works which, in consequence of the humidity of the summer, had only laid in insufficient supplies, have also forwarded to the collieries orders for the supplementary quantities needed by them to make good their required wants. There is thus a tolerable amount of activity at the mines, but prices remain feeble. Complaints are made of a scarcity of rolling stock upon the Northern of France Railway; this scarcity is due to the conveyance of beetroot at present upon a large scale over the Northern of France lines. Belgian coalowners are not free from uneasiness as to the competition which they may have to sustain from the coal of the Nord and the Pas-de-Calais when the great canal of the Nord is terminated.

THE MINERAL RESOURCES OF UTAH.

The great drawback to the prosperity of Utah is generally considered in the State to be the monopoly in carrying which the Government has given to the Union and Pacific Railroads and the only remedy is thought to be the building through of another and competing line, and preference is given to the Atchison, Topeka, and Santa Fé line as being the only one not under the influence of existing interests. As an illustration of the interest taken in the concern it is stated that nearly \$3,500,000 was subscribed in cash in Boston a few days for the purpose of constructing the Pueblo and Arkansas Valley Railroad up the Arkansas to Leadville, and the New Mexico and Southern Pacific from the north line of New Mexico, at Raton Pass, via Los Vegas, to Albuquerque on the Rio Grande, both roads are extensions of the Atchison, Topeka, and Santa Fé under new names; the first toward Utah, the second toward Fort Sumner, and will be operated by the principal line under lease. It has long been pointed out that the Arkansas river offers the only practicable railroad pass through the Colorado Sierra Madre to the westward. Once at Leadville, they are all but through and over the main range, having there reached an altitude of at least 10,000 ft. from the first Pacific water they strike leads them down to the Grand and Middle Park and there are tributaries of the Grand flowing from the west that will lead them easily into Utah, either Spanish Fork or Gunnison's route, further south.

The extent of mineral region which such a line would open up is enormous. There is enough mineral wealth in the southern part of the Territory to induce them to come, to say nothing of the mineral and other possibilities of eastern Utah and western Colorado, the site basis of the Green river above its junction with the Grand, the Colorado is formed and soon after is lost in the Grand Canyon. From all accounts that is good a country as Colorado, Wyoming, or Utah. But the resources of the southern part of which are better known. Immense fields of coal of good quality, containing iron ore, lead and silver mines, salt, sulphur, bismuth, copper, everything. Enough has been done with the coal and iron to prove that iron or steel for rails and all kinds of quartz and ore, racing, mining and railroad machinery can be made of the ores, with the enormous use of iron that must continue and increase all the vast interior, added to the cost of bringing it here from the East, something like \$40 a ton, it seems that it ought to be done great profit. There is at Grand Gulch an immense deposit of copper ore, very rich; transportation facilities are all that are required to make it exceedingly valuable. There is a deposit of ariferous lead about 50 miles from Beaver that has been but partially opened, and yet shows a million tons of ore carrying on an average of the whole mass, 45 per cent. lead and 50 ozs. of silver per ton. Regarding the coal and iron resources Mr. J. Blodgett, an ironmaster of Philadelphia writes that some time ago he analysed a sample of iron ore and limestone from Southern Utah, and holds the impression that these deposits are among the wonders of the world—are literally immense. If such coke as sent to him be produced there in quantity, Utah's iron resources must exceed those of any other section of the Union."

Great excitement is at present felt about the rich discovery of gold close to the property of the Last Chance Company of London. As usual in these cases adverse claims have been put in. Messrs. Bates and Egan are still taking ore out of the so-called Stuart, but as Mr. Holden claims the ledge as the Constitution, they are not taking the ore away. The ledge, so far as appears, is a large one, and quite a chamber of \$17 ore has been excavated. Further down the hill in a shaft they are getting very rich ore, going into the hundreds. But until it is decided what and whose mine it is, no thorough and extensive exploitation is probable. Mr. Holden bought the Constitution of Jo. Watson two years ago; it was in his tunnel the Stuart was discovered; he says he has proof that the Constitution title has never been forfeited by non-work; and he has run in ledge matter from the Constitution into the Stuart openings in three places some distance apart. Bates and Egan claim that the Stuart is a distinct vein from the Constitution, and if not, that the Constitution has been forfeited by abandonment. The suggestion made for settling the matter is that the several claimants, including Mr. May, who claims the ledge as the Kingston, should pool their claims, and sell the hill to Californians. Another gold lode is the Crosses, owned by Pittsburgh people, who have spent a great deal of money making openings that were of no use. Recently Mr. Henderson was placed in charge of it. He set some men to taking out ore near the surface, and is making occasional sales in considerable lots, for \$15 to \$20 a ton, chiefly gold. Negotiations are pending for the sale of a group of Bingham gold lodes, composed of the Highland Boy, American Lass, and Triplet, to Californians—price asked, \$35,000. Considerable work has been done on these veins, and the ore samples about \$20 a ton. At the bottom of a shaft sunk 150 ft. from the inner end of a tunnel, itself 300 ft. at that point beneath the surface, a cross-cut 90 ft. in length is said to have reached no walls. If there is one-tenth that width of \$20 ore 450 ft. from top of ground, it is well worth the \$35,000 asked for.

The Toledo Mine at Alta is among the coming sensations. There has recently been a change in management, Mr. Johnson retiring and Mr. Bentley being now in charge. It is reported that the 200 and 250 ft. levels are running east in a vein of rich ore 4 to 7 ft. thick, and have already exposed 25,000 cubic feet of it. The flagstaff shipped during August 710,430 lbs. of first-class, and 1,250,800 lbs. of second-class ore, 980 tons, worth about \$8000. The Ontario paid two dividends of \$50 000 each in August and yielded \$107,000 worth in July, and nearly \$140,000 worth in August. Prospecting and investing are going hand in hand east and west on the Ontario belt. All the land is being located as if for farms, for the chance of its containing other Ontarios. Mr. Morgan has secured the ground east to the McHenry. His Ontario Hill Mining Company is being organised in New York, and he expects to commence work some time in September without fail. In Bingham the yield of the Hampton and the fine run from the Constitution or the Stuart, or whatever it may be, have recalled attention to the abandoned gold "prospects" of the camp, and a new one is added to those claiming recognition nearly every day. Since the California mining sharps have gone wild over the \$6 rock of the Black Hills, it is thought the \$15 rock in Bingham is worth looking after. The price of silver was the same in August as in July \$1.13 per oz.; and there has been a rise of about \$2 in lead, \$28 being the current price at present.

NEW AND ECONOMIC LUBRICATOR.

The well-known qualities of the mineral variously known as plumbago, graphite, or blacklead have induced the invention of various means for applying the said substance to mechanical bearings for the purpose of reducing friction, the most efficient method of application so far known being the combination of the powdered mineral with an oil or liquid compound, which is poured into oil cups or upon the bearings in the ordinary manner. A great difficulty, however, in the way of the successful use of this method has been the impossibility hitherto of holding the powdered graphite in proper suspension in the fluent vehicle of its application, no oil having been discovered or compound invented, so far as is known, in which the graphite will remain in perfect suspension, even under the ordinary variations of atmospheric temperature; Mr. CLARK JOHNSTON, of Rochester, New York, therefore proposes a compound which shall overcome the obstacles heretofore existing to the application of graphite as a mechanical lubricant. The new lubricant which he has introduced consists of petroleum or other lubricating oil of commerce, African palm wax or its equivalent, pulverised graphite, the mineral extract of petroleum (or paraffin wax), and an alkali, combined in varying proportions to form either a solid or liquid lubricating medium, which, while holding its graphite in perfect suspension, will be efficient in use and cheap in production. And, secondly, in a solid or liquid compound, in varying proportions of petroleum, powdered graphite, mineral extract of petroleum, Japan wax, myrtle wax, Gambia wax, and an alkali, the proportions being varied according as a solid or liquid lubricant is desired.

The compound resulting from the combination of these ingredients he has found to have the property of holding its powdered graphite or plumbago in perfect suspension at a temperature of 180° Fahr., and when in liquid form to resist congelation from 30° to 40° lower than the temperature required to solidify the best qualities of winter strained sperm and No. 1 lard oil. For a liquid lubricating compound according to the first part of his invention, and holding its graphite in perfect suspension, he uses petroleum or other oil, 1 gallon; African palm (*Avoira Elais*) wax, 2 ozs.; graphite, powdered, 5 ozs.; mineral extract of petroleum, 1 oz.; bicarbonate of soda, or other alkali, 1 oz. This lubricator has been tested for 12 consecutive days on a steam chest under a heat of from 120° to 180° Fahr., without the least precipitation of the graphite. It will also resist congelation at a temperature 30° lower than is required to congeal No. 1 winter strained sperm oil, and 40° lower than is required to produce the same effect upon No. 1 lard oil.

In order to produce a solid compound according to the first part of his invention for application as tallow is ordinarily used, or by first melting and then pouring it around a journal, he uses petroleum or other oil, 1 gallon; graphite, 8 ozs.; African palm (*Avoira Elais*) wax, 8 ozs.; mineral extract of petroleum, 2 ozs.; bicarbonate of soda or equivalent alkali, 1 oz. The solid compound resulting from this formula when melted holds its graphite in perfect suspension, and its efficiency is not impaired by a heat of 350°. For the production of a lubricant in liquid form, according to the second part of his invention, he uses petroleum (30 to 37 gravity) 1 gallon; graphite or plumbago, pulverised, 3 to 5 ozs.; mineral extract of petroleum (or araffin wax), 1 oz.; myrtle wax, ½ oz.; Japan wax, 1 oz.; gambia wax, ½ oz.; bicarbonate of soda or equivalent alkali, 1 oz. For the solid form capable of use in the same manner as the tallow or the various plastic lubricants, the portions used are—Petroleum, 1 gallon; graphite or plumbago, 8 ozs.; mineral extract of petroleum (paraffin wax), 2 ozs.; Japan wax, 6 ozs.; myrtle wax, ½ oz.; gambia wax, ½ oz.; and bicarbonate of soda or equivalent alkali, 1 oz.

The method of preparing the compounds is the same, whatever proportions are used; he first heats the oil to about 80° Fahr., and then adds the alkali, the purpose of which is to "cut" the oil, or resolve the globules thereof into thin flat tissues well adapted to prevent the sinking or precipitation of the powdered graphite. He then melts together the mineral extract of petroleum and the wax or waxes to form a very adhesive unctuous compound, which is added as soon as the ingredients are well melted and mixed, and adheres to the tissues of the oil, and holds the powdered graphite, which is then introduced, the especial function of the mineral extract of petroleum being to increase the specific gravity of the whole to such an extent as to obviate the tendency of the graphite to sink. When the ingredients have all been added, but a few moments' exposure to the same heat while briskly agitated is sufficient to effect a thorough combination of the whole, which may cool either slowly or rapidly, the resultant product being either liquid or solid, according to the relative proportions of the constituents. Each of the substances used, except the alkali, is of itself a lubricant, and is of comparatively low cost, and the method of preparation is so inexpensive that the low price at which the compound of either part

of his invention can be placed in the market is one of the principal meritorious features thereof, and when to this is joined their great efficiency as lubricators on account of the absolute suspension of the graphite and their capacity to resist change under a wide range of temperature, they become articles conspicuous for adaptability to their intended purpose.

THE WILD DUCK, OR SPORTSMAN'S ARMS.

"Well, comrades," says Jan Temby, "since our last mitten I took a turn through Gwennap old bals, and should think 'tis a wisht sight to look upon as can be found in this world to see a passle of knacked bals. A few years ago the people wor as thick and busy as a swarm of bees, and now not a soul is to sen." "I'm afraid nearer home," says Old Tom, "will be as wisht as Gwennap very soon if tin and copper don't get up." "I've heard," says Jan Temby, "that foreboding, Tom, is wuss than witchcraft, and 'twill be time enough to cry out when we're knacked idle. Well, when I got to St. Dye I went into a public-house to have a pint of ale with my pastry, and then I met Uncle Jan Burrows, one of the oldest miners in Gwennap parish; so we had a comfortable little pint together. He told me what he could mind about the old bals, and what he heard his fayther and granfer say about old times. He said 200 years ago that Poldice was one of the greatest tin works all open to grass in Cornwall, and that a thousand people wor employed there, and that's the way so many great coffans are to be seen to this day. The people there used to sing—

"At Poldice the men are like mice,
The tin is very plenty;
Captain Teague is one of Breague,
And he'll give ten for twenty."

Old Wheal Jewell he said was a rich bal 90 years ago, and made a profit of 400,000. In "Consols" it is said the first steam engine in Gwennap was erected; at Wheal Virgin and this bal—about a mile long—made a profit of more than 700,000. In old times, said Uncle Jan, several families in Gwennap made their fortunes working for tin in Poldory, Cupboard, and Ale and Cakes, and afterwards these as United Mines divided profit of 300,000. Tresavean was first worked for tin, and when worked for copper gave profit of 800,000. Watt's trial engine was erected at Tingting. Whsal Daniel after making fine profits was to be "knacked," but Capt. Kitto was allowed to drive west in the 30 another fathom; in that distance a change took place, and soon the lode got rich, and a profit was made of 160,000. "Come," I said, "take a good swig of the ale, Uncle Jan, and then we'll have another discourse; but praps you'd like to smoke a bit fust." "Ise I would," says Uncle Jan. So we smoked away, and then Uncle Jan said, "I have often thought, neighbour Temby, it is the strangest thing in the world that scores of new bals have not been put to work in this parish; a few score acres I may say have produced millions worth of tin and copper. Young men may think old men are fools, but 'tisn't true; the old men discovered the best mines in the world for tin, and copper after. I wish the young men would do the same. There is plenty more in the district. When they have done this I will allow them to be so good men as our faythers and granfers, but not till then. There is another thing, neighbour Temby—the biggest and richest copper mines in Gwennap parish were first rich tin works, and the backs of the same bals are rich for tin still if our scientific young men knew, like the old men, where to find it." "I quite agree with ee, Uncle Jan," says I, "and now that we know that Dolcoath first tin, then the richest copper mine in Camborne parish, and now the best tin mine in the world, and also other great copper mines in the district now tin mines again. I wonder if your great copper mines Poldice and others that wor first rich for tin are not now rich tin mines again in the bottom, for when at Poldice the men were like mice working in the great open coffans for tin. Hundreds of men wor at work about the same time for tin in open coffans in Old Tye (now South Condurrow), which was then the largest work in Camborne parish, and I have often gone east on the backs of those old works before the Ba-sets wor heerd of from Old Tye to Carn Marth and the Gwennap Mines." "I don't doubt," says Uncle Jan, "but some of our mines, like Dolcoath, will be found rich for tin in the bottom, but with the present price for tin it would never pay to fork them; at the same time there is no need for such dead outlay while we have miles of good bals untouched, and which if opened and worked with the same judgment as the old men worked would pay well with tin at 30/- a ton, and soon beat the furriners, for they can't stand it, or carry on their stream works, leave alone their mines, with tin at 30/- a ton; besides, their price for miners' labour is three times more than ours, and everything else in proportion." "I'm fine and glad I mit with ee, Uncle Jan," says I, "and what do ee say—shall we have a pint of toddy before we part, for I'm loth to go after such pleasant discourse?" "I'm agreeable," says Uncle Jan, so we finished a very comfortable mitten with a couple pints of toddy, and if Uncle Jan can get a poney he will be here to our next mitten."

"He will be welcome," says Uncle Henny, "and we are all very well pleased, Jan Temby, with the account of your little journey." "Uncle Jan," says Cousin Will, "is right about the price of miners' wages in Australia, &c., for I have had letters lately which prove that miners are paid from 9s. to 10s. a core of eight hours, and the common-labourer 7s. Then, if you look at the cost of land carriage and all other charges, it is very clear that foreign stream-works cannot pay with tin at 30/- a ton, and our colonists are not the men to stick to a losing game. I am assured their stream-works will not pay under 50/- a ton, and at that price most of our mines would pay well. I fear, however, that we must wait until there is a general revival of trade throughout the world before we shall see tin again at 50/- a ton, or a corresponding increase in the price of copper, lead, iron, &c., so that instead of watching anxiously for better prices, it would, in my opinion, be wiser to economise in every direction there is room, adopt every real improvement, at surface and underground, and by the time we have carried out all the improvements which may be effected in our whole system of mining operations, we shall be prepared to meet and beat all competitors in the market." —From Cousin Jack's Unpublished MSS.

COPPER MINING IN AUSTRALIA.—We regret greatly to record the total stoppage of the works at the world-famed Wallaroo Mine. The announcement, although it came unexpectedly, excited but little surprise, inasmuch as the continued depression in the copper market had prepared the public for this unwelcome intelligence. Nevertheless the closing of this mine is extremely disheartening. Whilst the smaller properties have one after another succumbed to the stagnation of the metal market, the Wallaroo and Moonta Mines continued operations, although on a less extensive scale than before, and all hopes of an early revival of trade were not abandoned. The outlook at the present moment is, however, exceedingly gloomy so far as the mining industry is concerned, and the step taken by the directors of the Wallaroo Mine is amply justified. Great consideration has been shown for the men whom this cessation of operations will throw out of employment, and it is only just to the miners themselves to state that their conduct has been praiseworthy in the extreme, and that they have received the blow which has fallen upon them in a most manful spirit. The stoppage of works is to be so arranged as to leave the property in the best position for an immediate resumption of operations when an improvement takes place in the price of copper. At the Kurilla Mine, an adjacent property, the manager and employees have adopted a course infinitely to their credit. They have voluntarily offered to accept a reduction in their wages of 10 per cent., and it is to be hoped they will reap the benefit of their unselfish action. Whilst it is extremely discouraging that the prostration of one of the staple industries of the colony should be so long continued, it is consoling to find that the colonists, whom it so nearly affects, are meeting the calamity in a courageous spirit. The Government have been urged to provide work for the unemployed miners, and it is to be hoped they will see their way to do this. Should the long-expected rise in the market be near at hand the change will find the resources of the colony in this respect greater than ever, as the past fourteen or fifteen months have been employed in developing mines and in preparing them for the resumption of operations on a larger scale than before.

—South Australian Register.

RIDER'S HOT-AIR ENGINE.

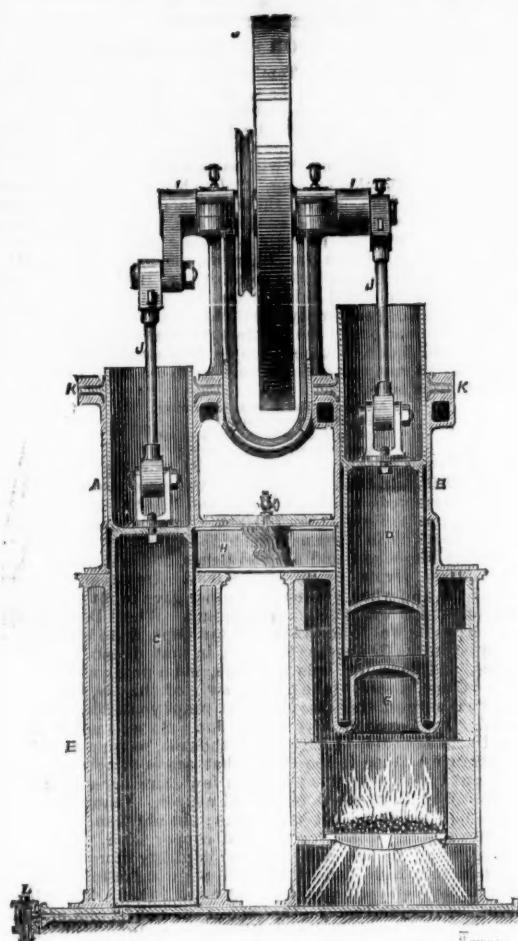


Fig. 1.—Sectional Elevation.

RIDER'S HOT-AIR ENGINE.

In the annexed engravings we illustrate the hot-air engine designed and patented by Mr. A. K. RIDER, the well-known American inventor of the automatic variable expansion gear, adapted to their horizontal engines by Messrs. HAYWARD TYLER and Co., with singular success.

It will be seen by referring to the sectional elevation in Fig. 1 that the engine proper consists of two external cylinders, A and B, which are respectively the compression and the power cylinders, C and D being the plungers, J J the connecting shafts, and I I the cranks. The power plunger, D, works inside the heater, F, which is suspended within the fire-box, and is thus exposed to the full heat of the fire. A pipe is disposed between the plunger and the heater, by which means thorough and rapid heating of the air, which is thus presented in a thin sheet only to the action of the fire, is insured. The air operated upon by the plunger, C, is kept cool by a current of water constantly circulating through the refrigerator, E. The power and compression cylinders are connected by the regenerator—one of the essential features of the engine. It is contained in the box, H, and is composed of a number of cast-iron plates, the thickness of whose edges is greater than that of the body of the plates themselves. Hence, when these are arranged side by side, a space is left between each for the passage of the body of air, which in traversing the plates is split up. It results therefrom that in its transit from the cylinder, B, to the refrigerator, the air leaves behind it all—or as nearly all as is mechanically possible—of its heat, reclaiming it, however, on its return journey before re-entering the heater. It will be seen at once that great economy is realised by this clever arrangement. The engine is so designed as to render the performance of the operation we have just described one of the greatest nicety. "So perfectly and accurately does this regenerator act," says the *Foreman Engineer* of the 1st inst., "that we have occasionally seen the box, K, almost mathematically bisected by a line drawn across it, occasioned by the heat of the burnt paint on the one side and the dampness and coolness on the other." The crank acted upon by the plunger, D, is somewhat longer than its fellow, whereby the advantage of leverage is secured for it. K K are leather washers, the function of the upper one being to regulate the lubrication of the plunger faces, whilst that of the under one is to prevent the escape of air. Should any loss, however, take place in this respect it is automatically replaced by means of the valve, L. A chimney, not shown in our engravings, is affixed to the back of the fire-box, and carries off all smoke, and at the same time increases the draught.

Having explained the parts of the engine, we shall now proceed to describe its working. To start it a revolution is imparted to the fly-wheel by the attendant, whereby the plunger, C, compresses the air around and beneath it to about one-third of its natural bulk. In the meantime, the power plunger is making its up-stroke; at this juncture, the downward stroke of the compression plunger being completed, the air is transferred through the regenerator to the heater, no change of volume taking place during the process. An increase of pressure proportionate to the increase of temperature is thus obtained, the effect of which is to force the power plunger to the termination of its stroke. The pressure which remains in the power cylinder re-acts on the compression plunger, projecting it upwards till it nearly reaches the top of its stroke, when, through the cooling of the air, the pressure decreases to its narrowest limits, the power plunger falls, and the whole operation recommences. Thus, it will be seen, that the same air is employed over and over again, it merely passing backwards and forwards between the cylinders.

In the 1-horse power engine the power cylinder is 10 in. in diameter and 13-in. stroke. The stopping of the engine is effected by turning on the cock, shown in the illustration as affixed to the regenerator box. The engine, as shown in Fig. 1, is arranged for transmitting power, and in Fig. 2, as adapted for pumping purposes. When employed for the latter purpose the water before delivery is circulated through the refrigerator, which is thus kept cool. This size of engine will raise water from the depth of 28 ft. at the rate of 1000 gallons an hour; in the case of greater depths the pump is placed below.

The advantages claimed by the patentee for this caloric engine are:—1. Its absolute safety, explosions being of a necessity out of the question (the greatest mishap that could arrive would be the burning out of the heater).—2. Its remarkable economy, only 35 lbs. of coke being consumed by the 1-horse power engine in ten hours.—3. Its exemption from the requirement of skilled labour, as all the attention called for is the replenishment of the fire from time to time.—4. Its comparative noiselessness. A long acquaintance with this useful little motor enables us to testify to its accomplishment of all

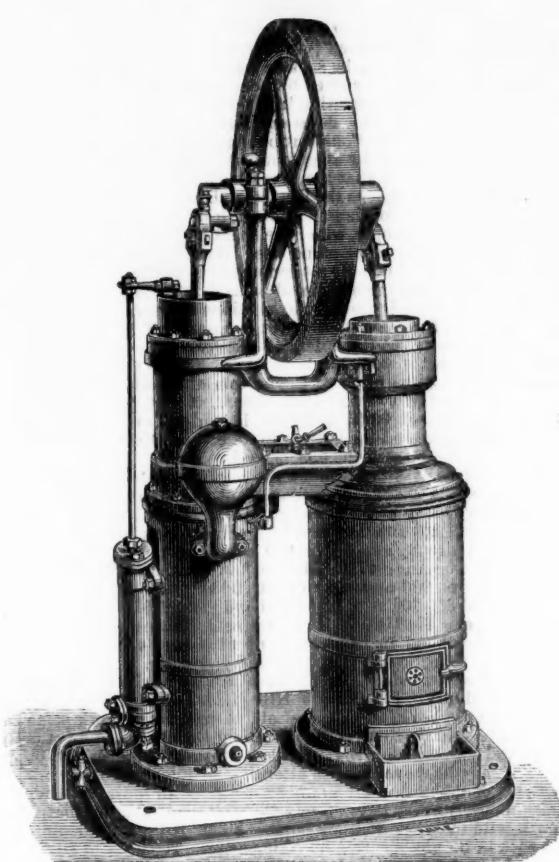


Fig. 2.—Arranged for Pumping Purpose.

these conditions. It is to be seen daily at work at the offices of Mr. OKES, M.I.M.E., 39, Queen Victoria-street.

We learn with pleasure that a Silver Medal has been awarded to this hot air engine at the Paris Exhibition.

PRODUCING SULPHUR FROM PYRITES.

Although produced in such large quantities in most mines, pyrites has usually been difficult to deal with profitably, and has never enjoyed a very ready market. When it contains less than 45 per cent. of sulphur it has usually been regarded as too poor for the production of sulphur, and unless the sulphur can be utilised the metals contained can seldom be extracted to advantage. To remove these difficulties Mr. JOHN HOLWAY, of Jeffrey's-square, has patented a method of treating both iron and cuprous iron pyrites in such a manner as to utilise the sulphides as fuel, and obtain nearly the whole of the sulphur as crude free sulphur and sulphurous acid, and in some cases sulphuretted hydrogen. He further obtains in separate groups the metals originally contained in the pyrites or other substances operated upon in the metallic state, or in the form of sulphides or oxides; and, lastly, he gets a slag rich in iron, from which metallic iron can be obtained. The furnace which he uses is a modification of the Bessemer converter, or of the ordinary blast-furnace, so closed at the top as to prevent the escape of the free sulphur, sulphurous acid, and the metallic substances carried over by the vapours. He drives in air at or near the bottom of the furnace, and by increasing or decreasing the quantity he regulates the temperature of the operation. Sulphide of iron being oxidised in preference to sulphide of copper, the latter always accumulates, and he withdraws the regulus whenever sufficiently rich in copper.

When commencing the operation it is convenient to run into the fixed furnace a quantity of molten sulphide of iron, and then introduced at or near the top of the furnace the pyrites or sulphides with or without other metalliferous substances and slag-producing materials; they descend, and the heat evolved from the oxidation of the sulphides in the lower part of the furnace causes part of the sulphur originally combined with the iron in the pyrites to be driven off as free sulphur, and the resulting sulphides are subsequently burnt by the oxygen of the air driven in at the lower part of the furnace, thereby producing the heat necessary for continuing the operations. When employing pyrites or residues therewith containing very little silica it is advisable to add silicious and other slag-producing materials in order to form with the oxide of iron produced an easily fusible liquid slag, of such a gravity that the resulting regulus being heavier will, when no longer agitated, sink through and collect below the molten slag.

He employs in preference metalliferous substances which will supply the necessary slag-producing materials, and is thus enabled to utilise substances which contain valuable metals in such small quantities as to render them unsuitable for treatment by ordinary methods. He withdraws from time to time the slag when the quantity becomes excessive, and so saturated with oxide of iron that it does not readily take up that formed by the oxidation of the sulphide of iron. Before introducing valuable metalliferous substances into the furnace he withdraws the slag, or renders it so basic by means of fluxes that the loss of the valuable metallic oxides is reduced to a minimum.

When he employs a fixed furnace, and continuously drives air through the sulphides contained therein, he finds that the regulus withdrawn therefrom is mixed with slag; he, therefore, either withdraws the regulus and slag at a temperature sufficiently high to permit them to separate before cooling, or runs them into another furnace, where he maintains them fluid by extraneous heat, or into a modified Bessemer, in either of which he continues the oxidation by means of air. After withdrawing the regulus he recommences introducing pyrites, and the slag left in the furnace being very hot expels as free sulphur part of the sulphur originally combined with the iron in the pyrites.

With an ordinary Bessemer plant, and employing pyrites containing 3½ per cent. of copper, he has obtained in actual experiments a regulus containing as much as 59.98 per cent. of copper, 48 ozs. 6 dwts. 3 grs. of silver, and 1 oz. 6 dwts. 3 grs. of gold per ton of regulus, with a slag containing less than one-tenth per cent. of copper. When thus operating the heat produced by the oxidation of the sulphides in the lower part of the furnace is sufficient not only to expel as free crude sulphur part of the sulphur combined with the iron in the pyrites, but there is a surplus of heat, which he utilises for treating other metalliferous substances, and thus obtains in different groups as metals, or in the form of sulphides, oxides, or as slag, the metals originally contained in the pyrites and in the other substances introduced into the furnace. He employs a hot blast of air when he desires to operate on a large proportion of metallic oxides as compared with the pyrites and sulphides employed, and when he desires to obtain a large proportion of free

sulphur, in lieu of employing all the surplus heat for treating metallic oxides, he introduces superheated steam into the furnace, in addition to the air, which latter he introduces as a hot blast, and in sufficient quantity to compensate for the reduction of temperature caused by the steam employed, and also to produce enough heat to expel as free sulphur about one equivalent—about one-half of the sulphur originally combined with the iron introduced at the upper part of the furnace.

By thus employing superheated steam he obtains free sulphur expelled from the pyrites, whereby proto-sulphide of iron is formed, and an additional quantity of sulphur liberated from the residual sulphides. While pyrites is being introduced care must be taken to prevent access of a greater volume of air than is necessary for the formation of sulphurous acid and oxide of iron by the combustion of the sulphide of iron contained in the lower part of the furnace; and, in preference, he employs furnaces of sufficient depth or height, so that the free oxygen of the air blown in neither comes in contact with the pyrites nor with the sulphur liberated, but is expended in the formation of oxide of iron and sulphurous acid, as before described. For the same reason it is desirable to introduce the pyrites in small pieces, and he thus utilises the small pyrites which has hitherto wasted. The high temperature at which the gases pass upward in the furnace assists the liberation of the sulphur, and the gases carry with them the free crude sulphur, as well as the metals and other substances volatilised.

MECHANICAL STOKING FOR COLLIERY BOILERS.

An interesting paper was recently read before the North of England Institute of Mining and Mechanical Engineers by Mr. ALEX. ROSS, and it has now by permission of the Council been printed separately. It appears that in 1817 a furnace was patented by Mr. Gregson in which the coal is projected into the furnace by means of a lever moved by a cam, and air is supplied to the furnace from a shaft carried by the side of and to the same height as the chimney. It seems that, according to Dalton and other authorities, the consumption of coal in this furnace was reduced 30 per cent. over the old one employed for the same purpose; that 1 lb. of coal ought to evaporate from 6 to 8 lbs. of water; and that, in fact, in an ordinary furnace 1 lb. of Hartley coal did evaporate about 5 lbs. 8 ozs. of water from a temperature of 212°, and under a pressure of 4 in. of mercury. But Gregson's furnace actually evaporated 7 lbs. 12 ozs. from the same temperature and pressure, whilst the temperature of the gases entering the chimney was reduced from 440° to 250°. The stream of invention has flowed on ever since, till the patents for the consumption of fuel have reached to several thousands, a slight description of them alone filling a thick volume. But all seem to have been laid aside from complication, liability to repair, and other reasons, and even at this very day the great majority of boilers are fired by hand.

After the Act for the compulsory prevention of smoke in the vicinity of towns came into operation the subject of mechanical stoking became, in Mr. Ross's opinion, of much greater importance, and he thinks that, as a rule, when hand-firing is practised more or less smoke is evolved from the chimney tops. To avoid this, mechanical stokers have been adopted, and have obtained the desired object with more or less success, and generally with a certain amount of economy of fuel. One of the earliest of these mechanical stokers that seems to have established itself permanently in public favour is the well-known Jukes' furnace, consisting of a series of short bars joined together after the manner of an endless chain, extending the whole width of the furnace, and revolving on two rollers, one outside and in front of the boiler, and the other underneath the boiler at the further end of the fire. These bars have a slow, continuous and adjustable motion given to them by means of a donkey engine and suitable gear. A small pipe, about 1 in. in diameter, is carried from the steam chest of the boiler, terminating in a perforated copper pipe which crosses the far end of the bars, for the purpose of extinguishing those coals that are about to fall off after having passed through the furnace. These jets of steam also serve to clean the bars and increase the draught. This contrivance, properly arranged, may be relied on for burning the fuel economically without producing smoke, but great care and attention is required to prevent the rapid destruction of the bars. Mr. Ross remarks that probably the next in importance amongst the mechanical stokers is Vicars's, which has been in use about twelve years. In this the bars are in one piece, and are so arranged that by means of a rotary motion given to cams acting on the bars causes the fuel to be gradually carried forward and consumed.

But the chief object of Mr. Ross's paper is to direct attention to Butcher's mechanical stoker, introduced into the northern coal district some time ago, bringing once more into operation one of the oldest of all the schemes for mechanically placing fuel on a furnace—namely, that of dropping small coal on a fan revolving at a high velocity, which projects it over the fire in minute particles. This principle, improved and combined with the practical arrangements made by Mr. Butcher, has been fairly successful at Seghill, Sileworth, and other collieries. Perhaps the most novel feature of the present form of the apparatus is the mode of conveying the coal to any number of boilers in a row by means of a worm working in a trough, which must necessarily save a considerable quantity of labour. Small coal brought by trucks is emptied in a hopper, to the bottom of which is conducted a worm working in a trough. This worm and trough run the full length of the whole range of boilers. Opposite each furnace there is a communication made from the trough, into which a portion of coal falls in its passage from furnace to furnace. In this communication a feeder works on a spindle with a reciprocating motion, communicated to it from a shaft, which also runs the whole length of the range. Particles of coal are thus pushed over the edge of the communication and fall on to two fans driven by means of cog wheels. It is, he says, needless to add that the smaller the coal supplied the better.

The fire-bars are of the ordinary kind, and are made to rock at intervals by means of a lever within reach of the attendant, who in this case can scarcely be called a fireman, since he has nothing whatever to do with the manipulation of the coal. Of course, an ordinary hopper can be supplied to each furnace instead of the worm and trough, although the latter is recommended where many boilers are together in a row. The bars appear to be durable, and the wear and tear could hardly be more than in other machines. There is almost a total absence of visible motion: the worm only requires a speed of 25 to 30 revolutions an hour to supply 14 furnaces, and the only parts which require any speed are the fans, and every precaution is taken to preserve and lubricate them.

MOUNTING THEODOLITES IN MINES—THE TRIPOD SUPERSEDED.—An ingenious arrangement for getting rid of the inconvenience of using a tripod for the theodolite in mine surveying has been invented by Mr. ERNST KOCH, the surveyor and a-sayer of the Senn Tunnel Company, and it has been found that the theodolite can be more easily and quickly got ready for use than by the use of a tripod. The apparatus and the theodolite are fastened by a wooden screw to the roof of the tunnel or level, either to the timber or to a small wooden block in the rock. There are suitable screws and slides for facilitating adjustment. The observations are not disturbed by cars passing underneath in ordinary levels, and in the exceptional case of the cars being too high to pass under the theodolite, a simple arrangement, which by merely turning a screw removes the whole apparatus out of the way, whilst after the cars have passed it is returned to its place so accurately that no delay is caused. The apparatus is very highly spoken of for saving time and ensuring accuracy.

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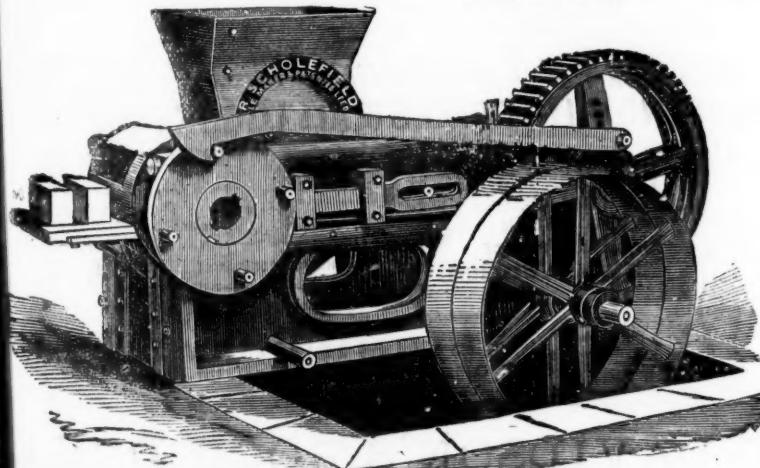
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1 boy taking off bricks from machine, and placing them in barrow ready for the kiln, 2s. per day	... 0 2 0
1 boy greasing, 1s. 6d. per day	... 0 1 6
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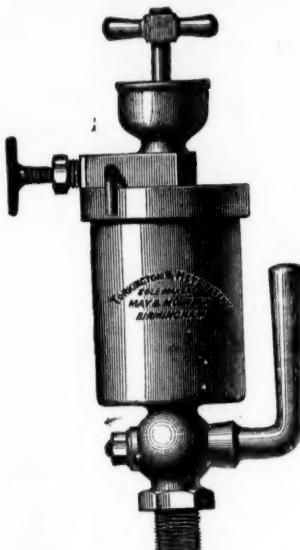
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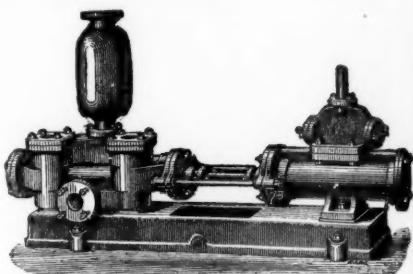
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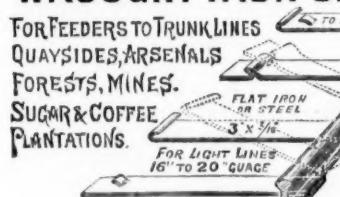


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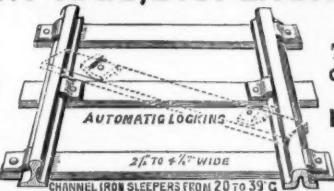
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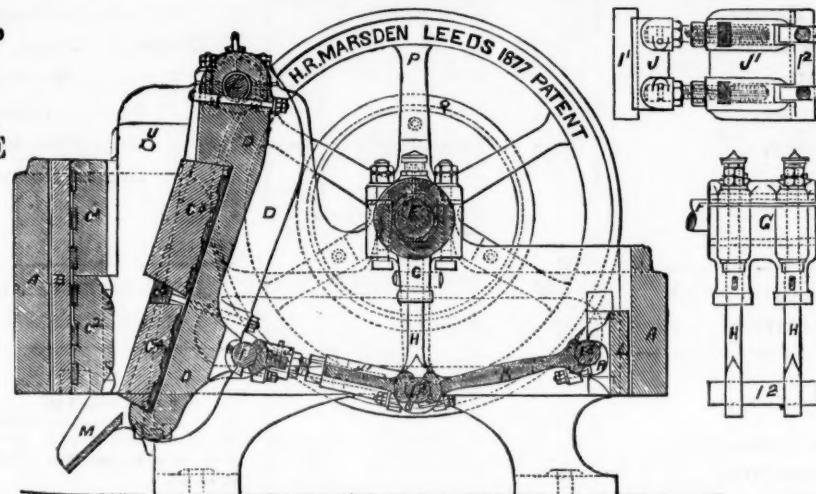
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